ELECTRICAL REVIEW

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Peak-Load Control

POSSIBILITIES OF DISCRIMINATIVE SHEDDING

GRAPHICAL representation of the variation of demand made upon the national power network indicates that the maximum load shed on any one occasion has been of the order of 1,150 MW, which is equivalent to about 10·6 per cent of the total load carried on the system at that particular time. The greatest reduction called for in any grid control area appears to have been about 25 per cent.

Control Room Task

This system easement is necessitated by the fact that the demand curve rises very steeply from 3,500 MW at 6 a.m. to over 10,500 MW at 8 a.m., when load shedding is apt to begin. The difference of some 7,000 MW may be made more striking by representing it as the equivalent of bringing nearly 120 turbo-generators, each of 60 MW, into full operation within two hours, or at an average rate equivalent to one machine every minute. Is there proper appreciation of the daily control room task—of trying to keep plant and load in step as nearly as possible—which is performed during the critical twenty minutes each morning?

The rise and fall of the system load reflects the electricity consuming habit of the nation and it is this habit of usage which has enabled the service to be provided economically. Electricity is not peculiar in this respect for very few kinds of public service could be rendered at a reasonable cost if the needs of the people who make use of them did not vary in extent and also differ in time. The latter is perhaps more significant than the former in our present consideration.

It is fortunate indeed that there is diversity between the requirements of consumers. This factor can be used to practical advantage because experience has shown the habit of consumers as a whole to be more or less regular. Peaks rise when the diversity factor is reduced to an extent that it cannot be relied upon by what, for want of a better term, may be called " irregular " uses of electricity.

Differentiation Between Loads

And so when assessing possible means of control one must differentiate between loads that are " peaky " and those which are steady, with due allowance for the fact that room warming—more often termed space heating—is not a domestic monopoly. Load control must therefore be discriminative. It must " lop " peaky loads without curbing the sale of energy, since the more electricity is consumed

over a period the cheaper will it tend to become by better utilization of existing generating and distribution equipment.

For these and other reasons given on page 317 we commend the suggestions there made as worthy of close consideration. The devices described in that article would seem to be producible in large quantities relatively quickly and inexpensively; they could probably be installed as easily and with little more circuit disturbance than the insertion of an ordinary fuse entails. The effectiveness of load shedding depends upon the promptness with which it is carried out. Some of it should be avoidable by discriminative tripping of local offending circuits early enough to prevent the necessity for complete disconnection of a whole area, or even interfering with all circuits of any particular installation.

PLANT CAPACITY

Although it is generally agreed that electrification upon the scale achieved in the United States should be our aim in this country, many people here question whether so much generating plant should be installed. In the United States a population of about 140 million is served by electrical plant of the order of 66,000 MW, i.e., 0·47 kW per head. During 1950 the capacity of plant installed was 6,700 MW. In Great Britain, at the end of 1950, 14,557 MW of plant served a population of about 50 million—0·29 kW per head. The gross capacity installed in 1950 was 1,030 MW, less than a sixth of that added in the United States.

COSTS OF MATERIALS

Figures published in the *Board of Trade Journal* illustrate how steeply the prices of materials used in the electrical machinery industry rose during 1950. Over thirty commodities are covered by the general price index which has been compiled, ranging from iron and steel to cotton tape and synthetic resins; the level at 30th June, 1949, is used as a basis (100). It is shown that there was a steady rise from 75 in January, 1945, to about 101 in December, 1947. In the two succeeding years there was something like stability until October, 1949, when devaluation raised the index to around 110. In May last year a rapid rise set in with the result that the index went up to over 142 in December. Since then the rise has continued and the index figure for January was 143·4.

DEARER COAL

Sir Norman Kipping, director-general of the Federation of British Industries, has expressed the concern of industrialists at the latest increase in the cost of coal which, he says, will place on them an additional burden of £50 million a year. He has told the Minister of Fuel and Power that the increase might have been deferred until the effect of the undertaking to increase production was seen. Particular objection is taken to the reversion to the practice of a flat-rate increase per ton. This is of special significance to the electricity supply industry in view of the large volume of low-grade coal which it uses.

ORDER OF GOING IN

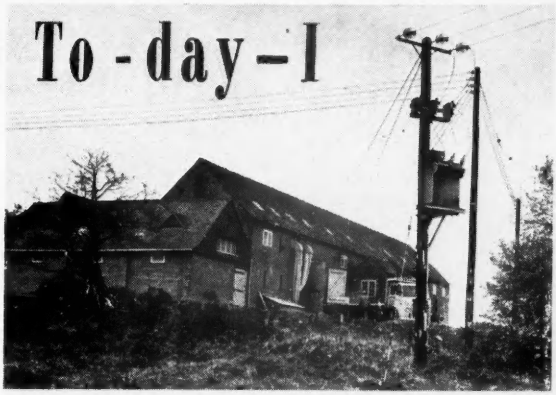
How the price of coal may counterbalance higher technical performance in generation is illustrated in the January *I.E.E. Journal*. Mr. P. B. Farley shows that, during the period taken, the five 53·5 MW sets at Hams Hall " B " station, despite the best overall heat rate at m.c.r. of 12,749 B.Th.U/kWh sent out, had to give place in order of running up in the Midlands central area to 30 MW sets at Meaford and Nottingham, although their figures were appreciably higher at 13,466 and 13,830. That was because fuel cost at Hams Hall was 0·312d as against 0·295d and 0·301d/kWh sent out from the other two stations.

AMERICAN TAX PROPOSALS

Among the proposals for additional taxation put before Congress by the United States Government is one to raise the sales tax on radio and television sets, refrigerators and other electrical appliances from 10 to 25 per cent on the manufacturers' prices. It is of interest to compare this with purchase tax charged in this country (on wholesale values). Domestic radio and television receivers are charged at 33⅓ per cent. Cooking equipment, wash boilers, kettles and some other appliances are exempt. The tax on electric space-heating appliances and immersion water heaters is 100 per cent. Thermal storage water heaters are charged at 66⅔ per cent and the majority of other domestic appliances bear a tax of 33⅓ per cent.

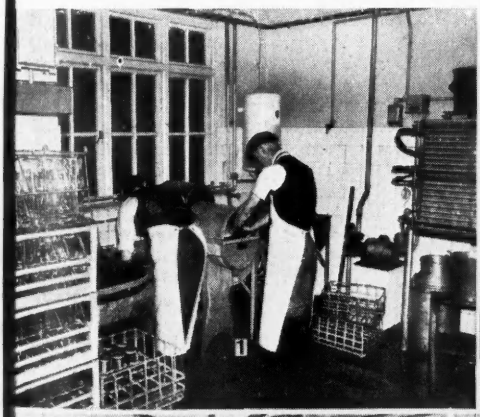
Farming To-day—I

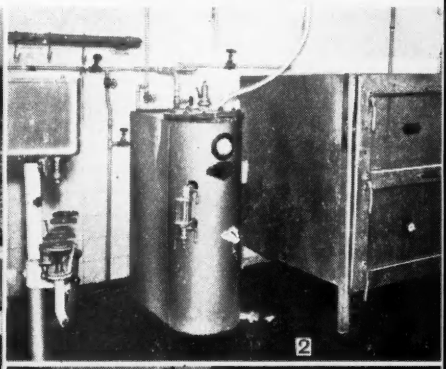
Increasing Production with the Aid of Electricity

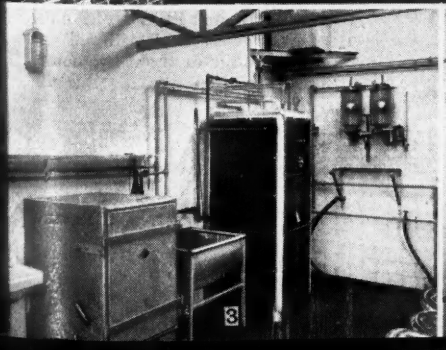


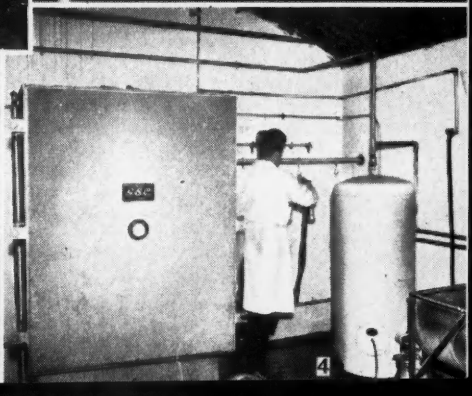
IN all industries the call to-day is for increased production if, with the limited resources available and with heavy commitments, the lowering of the standard of living of this country is to be avoided. Increased productivity is almost synonymous with more and better mechanization, which nearly always means the most extensive use of electricity. Probably in no industry is this truer than in farming and

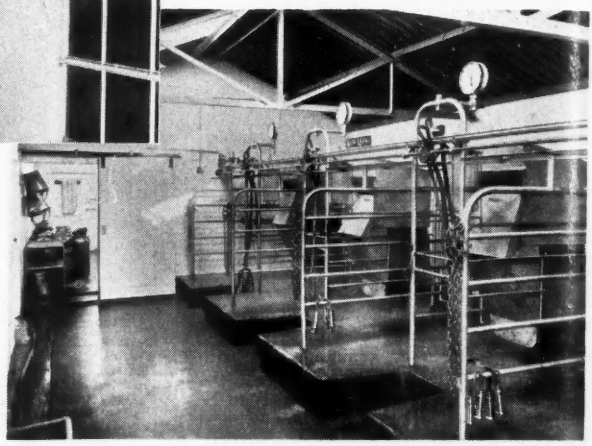
Above: **Typical service to a farm: a 25 kVA transformer supplying Carrimers Farm, Aston Tyrrell.** *Below:* **(1) Perkins bottle washer and Heatrae thermal storage water heater at Home Farm, Frilsham. (2) At the Home Farm a Perkins 18 kW steam raiser supplies not only the steam for the sterilizer but also most of the hot water required. (3) "Electrobloc" steam raiser serving wash-up trough, sterilizing chest and wash basin at Manor Farm, Little Bedwyn. (4) G.E.C. self-contained sterilizer and Woolley 35 gall water heater at Child's Court Farm, Yattendon**











Left: **Milking plant conveniently mounted on the wall out of the way of dirt and damage at Child's Court Farm, Yattendon and** *Below:* **Four combined milking and recording units dealing with eight cows at a time enable all the sixty or so cows in milk at Manor Farm, Little Bedwyn, to be dealt with in two hours**

it is largely to the electrification of their establishments, coupled with the greater use of tractors and combine harvesters, that farmers have been able since 1939 to increase home food production from about one-third to three-sevenths of the total consumed.

With the object of seeing something of the extent to which electricity has been adopted on the modern farm and also to get an idea of the scope for further development, we have recently completed a brief tour of a number of the more interesting establishments in one of the most highly electrified districts in the country, namely the Newbury Sub-Area of the Southern Electricity Board, which extends from the north of Oxford to the south of Andover and from east of Reading to the outskirts of Bath.

In referring to farms there is always the difficulty of deciding on the definition of a farm. In the 3,000 sq miles of the Sub-Area there are about 7,500 establishments which may reasonably be included in this classification. Of these about 4,000 take supplies for farming purposes.

As an indication of recent increased demands for electrical services, during the twelve months ended 31st March last 565 farms were connected, apparatus installed by the Board including 65 sterilizers, 34 steam raisers, 48 mills and 10 milk coolers; and nearly 8 million kWh was utilized under the farming tariff. In the first seven months of the current financial year 281 farms were connected; apparatus installed included 14 sterilizers, 20 steam raisers, 17 mills and 8 milk coolers; and approximately 5,700,000 kWh was consumed. No figures are available of the total numbers of appliances installed but it is estimated that there are now in use about 2,500 milking machines, 500 sterilizers, 350 steam raisers, 1,000 mills and 300 milk coolers and it is known for certain that there are at least 60 grain dryers within 11 miles radius of Newbury alone.

Messrs. Gauntlet & Sons, Manor Farm, Little Bedwyn, the first farm to which we were taken by Mr. S. T. Harman, agricultural adviser to the Newbury Sub-Area, might well be considered as a model for the dairy farmer. Since the buildings are entirely new, it has been possible to provide an almost ideal layout. The milking room, which is equipped with four combined milking and recording units dealing with eight cows at a time, has the floor of the milking area raised about 12in in order to facilitate the fitting of the clusters. With this arrangement and helped by excellent lighting from fluorescent fittings ("Smithlite") it is possible to deal with all the sixty or so cows in milk in about two hours.

Leading from the milking room is the cooling and sterilizing room. Attached to the wall backing on to the milking room is the cooling apparatus, while along the adjoining side of the room are a 4 kW

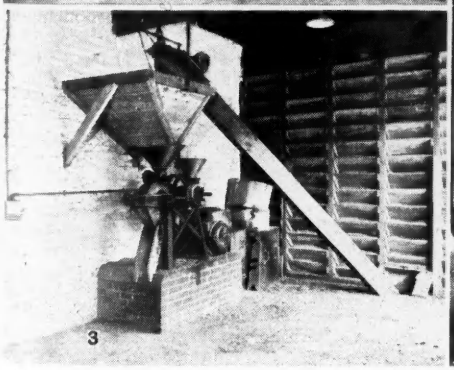
Woolley " Electrobloc " steam raiser, a 16 cu ft Stirling sterilizing chest, a wash-up trough and a wash basin. The steam raiser, which is Venner time switch controlled to operate at off-peak periods, provides hot water for washing as well as steam for sterilizing. Artificial illumination comes from bulkhead fittings (J. & E. Coughtrie) housing 100 W lamps.

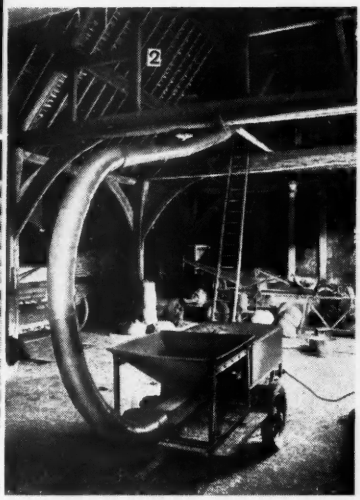
A small separate adjoining room accommodates the Alfa Laval milking plant vacuum pump which is normally driven by a G.E.C. 2 h.p. motor, a Petter standby petrol engine being provided as a safeguard against supply failures. There is also a neat example of main switchgear and distribution fuse board, the gear, which is fed through trunking, being mounted high up on the wall, easily accessible but out of the way of possible damage.

Another noteworthy feature is the partly covered yard for protecting the cows at night during inclement weather, the feeding stalls provided being artificially lighted. Bull pens, serving compartments and calf houses are also provided. Preparation of grain, beans, etc., for fodder is assisted by the use of one of the increasingly popular Essex mills, of which there must now be about 500 in use in the Sub-Area. The total load is about 10 kW.

The next three farms visited all belong to Lord Iliffe who owns about 2,000 acres of agricultural land in the district. Perhaps the most interesting piece of apparatus we saw on Home Farm, Frilsham, was a portable grain elevator. Incorporating a fan driven by an English Electric 3 h.p. motor, it can handle 2–3 tons of grain an hour and, being mounted on motor-car wheels, can readily be taken from farm to farm. A portable Michigan elevator ($\frac{3}{4}$ h.p. motor) is employed to carry grain from storage bins to a Bentall mill (5 h.p. Higgs motor) used for grinding up food for the stock on the farm. Grass is dried on a Kennedy & Kempe machine and there is a baler driven by a 10 h.p. motor.

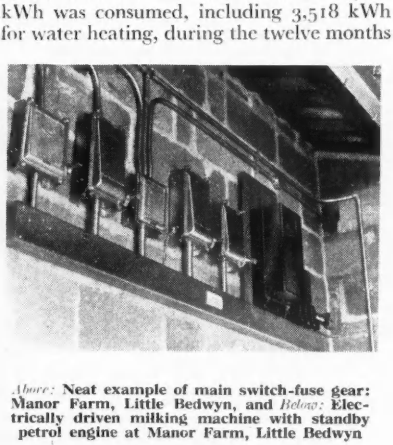
To milk the herd of sixty Red Polls a Gascoigne bucket-type milking machine is

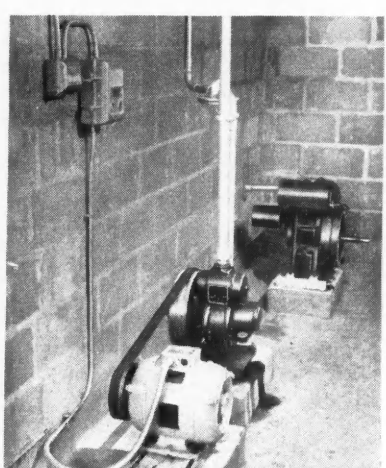




(1) Electrically driven and heated grain dryer in use at Child's Court Farm, Yattendon. (2) Portable grain elevator, with baling machine in the background at Home Farm, Frilsham. (3) Mill for grinding food for stock on Home Farm, Frilsham

used in conjunction with a 50 gall/hour cooler, refrigerated by a Kelvinator unit which also serves a 100 cu ft cold room. A Perkins 18 kW steam raiser supplies not only the steam for the sterilizer but also most of the hot water required, a supplementary service being available from a Heatrae thermal storage heater. The water is procured from a well by means of a Beresford ½ h.p. pump. A Perkins machine is employed for bottle washing. For the whole electrical service described 20,861 kWh was consumed, including 3,518 kWh for water heating, during the twelve months ended 17th November. The connected load is 37·5 kW.





Above: **Neat example of main switch-fuse gear: Manor Farm, Little Bedwyn, and** *Below:* **Electrically driven milking machine with standby petrol engine at Manor Farm, Little Bedwyn**

At Court Farm, Yattendon, where about thirty Jerseys are milked, there is a "Loheat" chilled water cooler, one of the most economical modern means of milk cooling, 100 gall of milk being cooled to an average of 45 deg F for a consumption of approximately 6 kWh. Also employed are a Gascoigne milker, a G.E.C. 48 cu ft sterilizer (9 kW), a Woolley 50 gall water heater (2 kW) and a Bamford mill (5 h.p. motor). In this case the annual consumption is approximately 7,200 kWh.

An electrically driven and heated grain drying plant is in use at the third of Lord Iliffe's establishments, Child's Court Farm, Yattendon, where 700 acres is cultivated partly as arable and partly as a dairy farm. The plant, a Kennedy & Kempe 30 cwt equipment, incorporates a bank of G.E.C. heating elements with a loading of 132 kW, and has a 20 h.p. motor for the dryer with a Crompton Parkinson 10 h.p. motor operating the fan which blows the grain into silos having a total capacity of 320 tons. The heaters are thermostatically controlled to give the drying temperature required. Electricity consumption varies but it can be taken that the consumption for 1 per cent moisture removed per ton of grain is approximately 15–20 kWh. Actual consumption during the year ended 3rd March, 1950, was 8,170 kWh supplied "off-peak."

Used in conjunction with the dryer are a Eureka cleaner (5 h.p. motor), Avery automatic weighing apparatus and a Sturtevant pneumatic conveyor (12 h.p.). Another interesting example of an electrically heated grain dryer is to be found at Buttermere Manor, near Hungerford. This is a Penny & Porter 1½ ton an hour plant with a heating load of 152 kW.

A feature of the dairy plant for the herd of forty-five Shorthorns in milk at Child's Court is the example of the way the milking plant (Gascoigne) can be conveniently mounted on the wall out of the way of dirt, damage and water. Sterilizing here is carried out by means of a G.E.C. self-contained chest of 48 cu ft capacity (9 kW). Hot water is supplied by a Woolley 35 gall water heater (2 kW). A Bentall mill (5 h.p. motor) is used for food preparation. Including the grain dryer, the approximate connected load is 189 kW.

A description of further installations will be included in a continuation of this article.

Discriminative Load Shedding

Control of Heating Load by Voltage Drop

By G. T. SHEARS, A.M.I.E.E.

It is now acknowledged that the winter peak demand for electricity will not be satisfied in full for some years to come and, consequently, load shedding assumes a different perspective. Whereas load shedding at peak times has been regarded as an interim measure, it is now apparent that it must be accepted as an established procedure and receive treatment commensurate with its importance. Since demand can be related to the severity of the weather, space heating is rightly regarded as being the principal creator of the sharp morning and evening peaks. If the increasing demands of industry are to be satisfied without interruption of supplies, and it is absolutely vital that they should be, the electric heating load must be controlled.

The problem is how to control the heating load without curbing the sale of energy. It has been suggested that industrial and domestic distribution networks should be separated to facilitate shedding domestic load while maintaining supplies to industry. In new towns this policy might be pursued, but in existing situations the cost, materials and labour make it impracticable, particularly as the effort would not contribute the electrical energy which might result from the application of equivalent effort to plant manufacture and building. Also, is it entirely satisfactory to inflict sustained total disconnection on numerous domestic consumers? It would have industrial repercussions due to dislocation of workers' home life and, furthermore, space heating is not a domestic monopoly.

Clearly, the problem requires deeper investigation and possibly the spending of some capital to obtain compromise, let alone solution. There are some well-known systems of control by injection, etc., which would permit the disconnection of selected apparatus, providing the requisite equipment were installed in consumers' premises. To operate such a scheme it would be necessary either to obtain legislation to compel consumers to accept controlled heating circuits, or to attract them by tariff incentives; obviously, the latter course is to be preferred. Load-shed warning could be conveyed to industry by the same mechanism and would ostensibly meet industrialists' earnest plea for notification before disconnection. Warning would assist industry, but it is not the answer, as it does not conserve power. Technically, any form of alarm is difficult to operate as the effectiveness of load shedding depends on the promptness with which it is carried out after having decided that it is necessary.

Let attention be devoted to reducing the peak demand, but the scheme must be cheap and simple and utilize existing facilities as much as possible. The present method of shedding load is only effective because the first and second stages (10 per cent in most cases) are achieved by reducing voltage, as this is a quick and centralized operation. It is suggested that without voltage reduction load shedding would be an unwieldy and ineffective operation. As voltage reduction precedes disconnection of load, alleviation could be obtained by making the space heating load sensitive to voltage, apparatus being connected at the consumer's terminal.

On first thoughts, a device comes to mind which is virtually an impedance relay with hand reset contacts (Fig. 1).

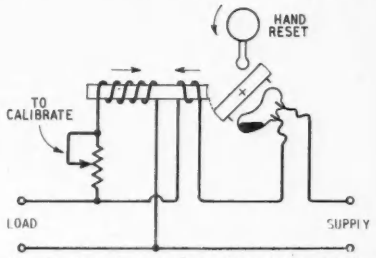


Fig. 1.—Impedance relay with hand resetting contacts, shown de-energized

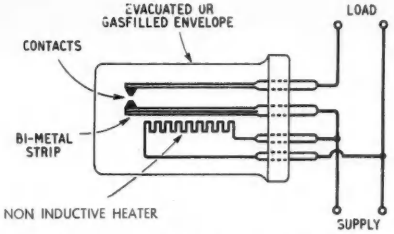


Fig. 2.—Thermal switch load limiter, shown de-energized

The voltage and current windings are arranged in opposition and the contacts open when the load current has neutralized the field produced by the voltage coil. When the voltage is normal any load up to that predetermined by calibration may be carried, but at reduced voltage the maximum demand is restricted. Example: with the relay set for 10 A maximum the load at 240 V equals 2,400 W. Voltage is reduced by 10 per cent to 216 V and, sympathetically, the contacts will open with 10 per cent less current (9 A) equivalent to 216 × 9 equals 1,944 W. The maximum demand has thus been reduced by 19 per cent, for if load exceeds 1,944 W the supply is interrupted. This arrangement would counter the tendency of consumers to switch on two bars of a fire when one is insufficient through voltage reduction. It does permit greater load to be taken at times of normal voltage, but the increase is too small and would result in limitation at off-peak times.

Continuing on the same idea, that is, utilizing voltage reduction to restrict load, a further type of limiter might suffice if it could use the heat available from a non-inductive resistance, which is proportionate to the applied voltage squared. This attribute might be worth exploiting, for instance Fig. 2 shows that if a thermal switch which closes in the excited state when energized from the mains could be made responsive to the square of the voltage, a most effective load limiter would result which would not limit off-peak demands. The design of such an apparatus is the prerogative of the thermionic section of the industry. It would need to be a plug-in device of low cost and readily mass-produced. It is assumed that the current consumption of the heater would be small.

If heating loads were connected through switches of this kind situated on consumers' premises, voltage could be reduced as at present to effect load reductions and then, at a pre-determined low voltage, the heating load could be removed at will without additional apparatus being required at the substation or generating station.

No originality is claimed for the suggestions illustrated and the difficulty of adapting them to cope with the normal voltage variations experienced on distribution networks is acknowledged. It is further suggested that all cooking load should be exempt from limitation. The proposals are made as a modest contribution to start engineers thinking along the lines on which electricity supply policy must be based in future. No doubt there will always be peak problems; if relief can be afforded the result will be economic, irrespective of the generating plant available. The important aspect is that efforts must be directed towards tangible ends; protracted discussion must now give way to engineering activities. Load spreading and shedding by target working, etc., are sincere gestures, but none of these methods ensures that electricity is utilized with the same seriousness as that with which it is produced. If persuasive methods can be adopted, even with additional apparatus, they must include some financial incentive, which constitutes the realistic approach to the problem.

It is well to look ahead, for a very acute problem will be the absence of night load or, more precisely, the devastating rate of pick-up necessary to cope with the morning peak. Generating plant is one of the nation's capital assets and justifies considerable effort to preserve it; peak limitation would contribute to this preservation.

E.A.W. Bradford Branch

BRADFORD is the seventeenth branch of the Electrical Association for Women to come of age. The celebrations took the form of a dinner on 26th January, when speakers were the Lord Mayor of Bradford who replied to the civic toast proposed by Mrs. E. M. Brown member of the E.A.W. National Advisory Council, and a former branch officer; Mr. A. Haselhurst, chief commercial officer, Yorkshire Electricity Board, who proposed the "E.A.W. 21st Birthday" to which Dame Caroline Haslett, E.A.W. director, replied; and Mr. A. Spalding, director of education for Bradford who replied to the toast of "Our Guests" given by Miss M. Parker, hon. treasurer of the branch. Mrs. C. Cowling, branch-chairman, presided.

ELECTRICAL CONTRACTING: Organization and Routine

By H. R. TAUNTON, A.M.I.E.E.

26.—*The Future of the Industry*

EVERY now and again some new word crystallizes for us our undying faith in "jam to-morrow." Just after the first world war it was "Reconstruction"—and the ramshackle result slumped about our ears in the early 'twenties. To-day, after another war, the talk is all of "Planned Economy"; what, just before the war, we used to call "Rationalization." Like one of Humpty Dumpty's words it means just what the speaker chooses it to mean. If we take it as embracing the fixing of standards of quality and prices, co-operative effort towards better trading and working conditions, the avoidance of wasteful competition and excessive working expenses by processes of amalgamation—("That's a great deal to make one word mean," as Alice said) then rationalization (or planned economy, if you like) is just what the electrical contracting industry needs.

This is the final instalment of Mr. Taunton's series of articles which have covered every phase of the organization and operation of an electrical contracting business in a practical way, reflecting the author's experience in the industry

The fixing of prices which will ensure to the contractor a fair remuneration for his work is an almost impossible problem. There is not the uniformity in any unit of installation work or in the conditions under which it is produced to afford a definite basis of calculation, such as there is in manufacturing work. The most that can be done in that direction—and something has been done—is by way of agreement on a fair scale of charges for day work and jobbing work. Estimating for original contracts is likely, therefore, to remain competitive. To redeem it from the wild-cat scramble it now is, we can only rely upon the gradual betterment of conditions in the trade, combined with a possible reduction in the number of competitors.

A wide policy of amalgamation would go a long way towards it, while at the same time lowering costs to the public by increasing the purchasing powers of the larger firms resulting and by reducing their standing charges. Their full advantage, however, would only be temporary. The fact that there were, say, only one or two firms operating in a district would certainly attract competitors; so that a local monopoly is hardly a permanent possibility. Nevertheless, an amalgamation would still have the advantages over smaller newcomers of greater capital and wider powers; and it is possible that the future trend of the industry will be in that direction, as it is in other industries.

Short of amalgamation, much can be done towards the lessening of needless competition by an expansion of the spirit of co-operation. It lies, indeed, at the back of all trade organization. The E.C.A. itself is in principle a co-operative body through which the leading contractors work together to secure benefits for themselves, and the industry, which they could never obtain by individual effort.

It is interesting to speculate on the possible future developments of centralized co-operation in the contracting trade: for instance, large-scale buying. If some extension of the N.E.C.T.A. were in a position to place bulk orders with selected makers for all the commoner requirements of all its members, one can imagine the makers' frenzied competition for them. One can see them come cap in hand to tremble in the anterooms of Africa House, waiting the august pleasure of the contractors' Buying Committee, whose nod is fortune and its frown, despair. A pleasing picture.

Centralized co-operation is essentially a

matter of supporting the existing trade organization; but there is also local co-operation, which can show perhaps more immediate benefits to individuals. It can be limited—nothing more, perhaps, than an occasional joint advertising campaign, as earlier suggested; it can be extensive, almost to the point of amalgamation, and yet leave to each contractor his independence, his freedom to compete where competition is sane and necessary.

Co-operative Showrooms

Consider, for example, the possibilities of a co-operative showroom. Few contractors can afford one on a scale which would make it an effective counter-attraction to those of the Electricity Boards. But each could afford, say, a sixth part; and if half a dozen of them in a town combined together to rent a suitable shop in a good thoroughfare, they could equip it and run it on a scale comparable with that of their joint competitor. A small limited company would be a suitable organization for its control, a completely independent unit, of which the six would be shareholders and directors, each contributing a share of the necessary capital proportionate to their resources and dividing the profits accordingly.

A co-operative stock would be an easy extension of the policy of a co-operative showroom, once adopted. Part of the same premises could be used, with the same general organization, and the same staff, plus a storekeeper. The usual jobbing stock of a large contracting firm would be kept there, and each of the co-operators would draw on it by requisition, as he would by order on a wholesaler. The difference would be that the goods would be invoiced to him at cost. As a result the stores would show a nominal loss, representing its running costs, which would have to be met by each of the co-operators in proportion to the total value of his requisitions. Whatever it was, it would certainly be much less than it would have cost him to run his own stores; and the other advantages are obvious. Further large economies to them all would result from a joint stock of tools and tackle, including mechanized plant which individually they could not afford.

The prophet is apt to make the future a projection of his own present. The vaticinations of a luckless dyspeptic are of woe and black disaster; he on whom the sun has smiled is sure that to-morrow it will shine on all. So any prophecy of the future of electrical contracting will always be coloured by the experiences of he who makes it. One may have struggled long against the many evils which can harry the contractor: lack of capital, unlucky estimating, dwindling trade, and increasing competition. Disillusioned and soured, he will not allow to others any better fate than he has had.

In his early days, he will tell you, there were public buildings, churches, factories and country houses galore, a thousand potential installations for every contractor then in business, all " plums " anxious to be picked at any price. (He is exaggerating: there have always been more pickers than plums.)

With those exploited—all too permanently, he groans—contractors are forced to look for new outlets. Their supply, what the builders leave of them, is limited, and so we have an orgy of undercutting, an insensate competition almost as crippling to those who, by gambling the deepest, get the order, as to those who do not. So nothing of worth will remain to-morrow for the contractor. Even the petty work he is allowed to do under the assisted wiring schemes of the Area Boards is gradually being taken over by them. Soon there will be no wiring left to him; and in the meantime he will have lost to them all his once lucrative trade as a retailer. Already they have lured the best of his customers to their showrooms, lavishly displaying everything electrical, from refrigerators to bell-pushes. Nothing will be left to him. No wiring, no sales; the field of his opportunities narrowed every year by stern arithmetic; powerful competitors from without jostling him in it, and presently out of it: the narrow path of livelihood can only end for him in a ditch. It can never lead him to even the humblest future. To-day he is struggling for a bare existence; to-morrow he will be gone.

Optimist's Viewpoint

Thus the pessimist. But he who would paint the distant prospect may dip his brush in scarlet and gold as easily as in black. The next contractor you meet will laugh at the other's jeremiads. He is in a biggish way of business, his bank manager is polite to him, and he has a sound digestion. Hear the optimist.

Were it true that all the small wiring, the jobbing and maintenance, mainstay of

four fifths of the trade, will be taken over in the early future by the supply authorities, yet there would be nothing in that to deplore. Rather the reverse. Certainly it would tend to eliminate the little men. Let them go. Those who were left would be the bigger and better firms, who would cheerfully resign to the Area Boards the trouble and risk of all the small scale trading they want to take over. The industry would be more compact, more easily organized, more adaptable to development by co-operation and centralization. It would be stronger; and in time it would hold undisputed the monopoly, more and more valuable, of all big installation work; a select body of specialists, waxing in honour and profit.

The fewer, larger, stronger firms surviving will certainly co-operate, if in nothing else, in running showrooms for the sale and hire-purchase of appliances, as large and as well equipped as those of the Area Boards, successfully competing with them. Between trader and official, in matters of commerce, victory must ever remain with him who has the stimulus of trading interest, and not the drag of officialdom. Ultimately the Boards would be persuaded to the wisdom of shutting down their wasteful wiring and selling organizations, and confine themselves to their legitimate function of distributing electric power.

Perhaps we had better part company with the optimist before he leads us too far into fairyland and, ignoring both him and the pessimist, try and pick our own way into the future, treading delicately from known facts to reasonable conclusions.

A Growing Industry

We can start with an axiom: that we are still only at the beginning of the electrical era; that for generations to come, until some unsuspected principle of Nature replaces it, electricity will be increasingly the motive agent of our material civilization; and that therefore the electrical industry in all its ramifications is destined to a commanding future. And since electrical installation work in its widest sense is an essential part of the industry, it must share in that great future. So much is certain; but what mainly interests us is whether *we* shall have a place in that future. Or will our trade lose its identity, become a mere side-line of some more powerful interest: the supply authorities, an adjunct of their service; the manufacturers, a channel for the sale of their material; of the builders, an increasingly important subsection of their main contracts? All are possibilities.

Contractors as Specialists

Compulsory regulations enforced by heavy penalties, effectively purging the electrical contracting body of its parasites, will leave it much reduced in number, but thereby the stronger. Entry to it will be less easy: impossible to anyone who shirks its new fixed standards. There will, therefore, be no further danger of an increase in its membership disproportionate to the volume of work available for it. It will be and remain—to quote our optimist again—"a select body of specialists." In that capacity it will be easier for us to follow its probable future progress. It is, indeed, only in that capacity it can progress at all.

Only by specializing in work which really calls for technical capacity and experience, backed by a sound business organization, will genuine contractors establish themselves as a recognized and indispensable body of skilled craftsmen. They must show that they, only, are competent to undertake the heavy and complex engineering work of a large lighting, heating and power installation. And eventually the small work, valuable by its sheer volume, will be left automatically to them, to be taken in their stride.

We have now reached this happy point in our argument: that we have a relatively small but strong body of contractors, recognized as specialists in electrical installation work, and thereby freed from all external competition. How will that body develop?

After the first great step in rationalization has been taken, it will certainly be a small, close corporation, admission to it a privilege not easily to be gained. All will be members of the E.C.A. Allied Associations. That flourishing organization will as heretofore negotiate when necessary on their behalf and guard their general interests against changing circumstances. The common welfare thus provided for, contractors will be left free to local and individual development. There will still be competition between them, but it will be fair and reasonable—not the cut-throat gamble of to-day. It will be minimized, naturally by the reduced number of competitors, and systematically by co-operation. Nor need the public suffer. The fewer and bigger firms,

with much of their organization in common, will be able to share with their customers the large saving they will effect in their overheads.

Wherever there are more than one or two contractors in a district, they will have a co-operative showroom and stores, centrally situated. Their individual premises will be no more than drawing offices and counting-houses. They will buy the bulk of their material co-operatively, and have a joint stock of tools and tackle. Each will have his own nucleus of permanent charge-hands, but they will have in common a floating fund of labour, which will thus be ensured of more continuous employment than at present. They will work together where unity will benefit them all; but in all else they will preserve their independence, each as free as now to develop any qualities he may have which merit him success beyond his fellows. Every man for himself, they will struggle, as of yore, for the largest share of the available turnover; less intensely, however, not only for the reasons mentioned earlier, but because most firms will have become specialists in one particular branch of contracting.

The future will almost necessarily be an era of specialization. The growing scale and complexity of electrical equipment will make it practically impossible for any one man to know all about all of it. So we shall find one firm devoting itself to architectural lighting; another to heating, a third to power, and so on. It might easily happen, therefore, that the half-dozen contractors in one town might all be specialists in different branches, so that they would compete less against each other than against similar specialists in other towns. Competition will tend to be less localized; and for a big contract, in Bristol, say, calling for a number of specialists, we might have the interesting spectacle of the whole of the Newcastle contracting trade competing co-operatively for the order against the similarly organized efforts of Birmingham.

Development will in those days be swift, acceleration its natural law. Any non-specialist firms, between one contract of a kind and the chance of another, will find themselves hopelessly at sea among new ideas and methods which have sprung up unguessed by them. The specialist will not only know all about them; he will probably have helped to develop them, experimenting here, improving there, and picking up the fruit as he runs, like Atalanta. Who shall set a limit to his rewards? They will increase with the increasing uses of electricity; and who so bold as to set a limit to those?

We are but at the dawn of the new age, the age of electricity. The electrical contractor will always be among its honoured ministers; and in its distant evening he will still survive to be the eager pioneer of its successor—the age of the atom.

Scottish Gas Complaint

THE North of Scotland Hydro-Electric Board's plan for supplying electricity to a new housing scheme at Crieff were referred to at a meeting of the Scottish Gas Council at Edinburgh last week. A resolution was passed by the Council deprecating the practice of Electricity Boards of offering to reduce or waive charges for laying mains to housing estates if local authorities installed electric cookers and wash-boilers, or excluded gas entirely.

In a statement issued from its South Caledonia Area office at Perth the Hydro-Electric Board denied that it was depriving tenants of housing schemes of the right of freedom of choice in the method of cooking or washing. The Board welcomed freedom of choice but for years in many parts of its Area local authorities had installed and were still installing nothing but gas cookers, and tenants had had no option but to cook by this method. The provision of electricity to housing schemes was entirely a question of economics. The Board was doing its utmost to keep the cost of electricity as low as possible and one way was to ensure that each item of equipment was making its full contribution as a revenue-earning asset. If local authorities decided that electricity was to be used for lighting and small appliances only, the revenue to the Board was not sufficient to pay for the cost of providing the supply. Thus the Board was reluctantly compelled to ask for a capital contribution towards the cost of mains and services. If electric cookers and wash-boilers were installed the revenue obtained was usually sufficient to pay for the cost of providing the supply and no capital contribution was necessary. Local authorities could install electricity and gas points and leave it to tenants to make their own choice. Some householders would cook by electricity and better use of mains and services would be made, so that the Board could reduce the capital contribution.

VIEWS on the NEWS

By REFLECTOR

FROM time to time I have deprecated the tendency of the lay Press to make too much of the hardships which electricity consumers are alleged to be suffering as a result of load shedding. At a recent E.A.W. meeting the matter was put into a more reasonable light by Mr. E. Braathen, manager of the Birmingham Sub-Area, Midlands Electricity Board. He is reported to have said that the most unfortunate consumer had only been deprived at various times of a total of 3½ hours' electricity during the winter.

* * *

I am not surprised that there was "Opposition laughter" in the House of Commons when Mr. Noel-Baker said that the prohibition of display lighting had had "an excellent psychological effect" in encouraging the public to save gas and electricity. If psychology and not fuel-saving was the principal aim I think the Minister was wrong. The darkening of our towns is more likely to produce despondency and depression than a resolve to switch off electrical apparatus and lamps. Such small and questionable economies can be too highly paid for in terms of misery.

* * *

A Cheltenham correspondent to a local paper points out that by switching off 2,000 100 W street lamps two hours earlier 400 kW would be saved, "the equivalent of a one-bar fire being used for 400 hours." It would be much better not to use the fire, of course. These correspondents do not realise that such arguments merely show how little energy is saved by inflicting darkness and inconvenience on the public.

* * *

Before the war it used to be a source of complaint among some local authority undertakings that there was an excessive flitting from job to job which had an unsettling influence on staffs. Nowadays the housing problem has made any sort of move difficult, and I suppose nationalization has also altered the position. From a report I have just received from Australia, however, I see that this matter is still a cause of concern there. Dealing with recruitment, the general manager of the Sydney County Council comments that to obtain an effective staff increase of 194 in a year it was necessary to appoint no fewer than 1,097 persons from outside the Council's service. This, as is pointed out, caused a great deal of extra work for the officers concerned.

* * *

One of the things the Patent Office doesn't believe in is perpetual motion and yet inventors persist in trying to file specifications for devices which run for ever without relying on any outside agency. The latest is an arrangement devised by a Midlands man who claims that it could be used for electricity generation and by multiplying the number of units the horse-power obtainable would be unlimited. The invention, for which a patent is being sought, is somewhat sketchily described as a system of reciprocating weights and springs.

* * *

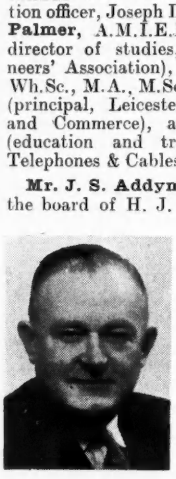
Another invention which calls for attention is dealt with in the *Bristol Evening World* which reports that the inventor "thought there should be some system which could keep lights burning when the current is cut off." The report proceeds:—"So back he went to his workshop, closeted himself there for the better part of four days, and emerged with a small black wooden box equipped with fuses, bulbs, batteries and wires. And it worked. By disconnecting the electric current the emergency system immediately came into action, lighting the special bulb inside the standard one." Certain manufacturers must look to their laurels.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE second specialist productivity team to study methods of training for industry in the United States sailed in the *Queen Elizabeth* for America on 8th February, under the auspices of the Anglo-American Council on Productivity. The members of the team include **Mr. J. R. Armstrong** (chief education officer, Joseph Lucas, Ltd.), **Mr. A. M. F. Palmer,** A.M.I.E.E. (technical editor and director of studies, Electrical Power Engineers' Association), **Dr. H. L. Haslegrave,** Wh.Sc., M.A., M.Sc., M.I.Mech.E., M.I.E.E. (principal, Leicester College of Technology and Commerce), and **Mr. D. C. Taylor** (education and training officer, Standard Telephones & Cables, Ltd.).

Mr. J. S. Addyman has been appointed to the board of H. J. Baldwin & Co., Ltd., as sales director. Since 1930, shortly after joining the company, he has been its London office and area manager.

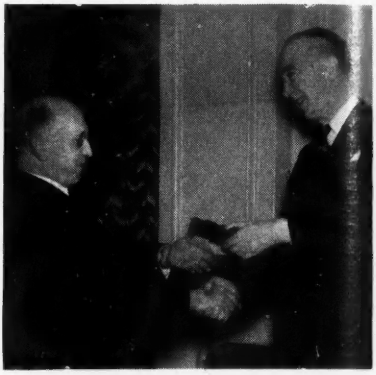


Mr. J. S. Addyman

Mr. C. K. F. Hague, deputy chairman and managing director of Babcock & Wilcox, Ltd., has just returned from South Africa where he went to lay the foundation stone of the new £500,000 factory which is being built for Babcock & Wilcox of South Africa (Pty.), Ltd., on a 46-acre site at Duncanville, Vereeniging. Present at the ceremony, which took place on 2nd February, were about 150 guests, including Mr. A. M. Jacobs, chairman of the South African Electricity Supply Commission. The new factory is expected to commence operation early in 1952.

Tube Investments Ltd., announces that the following have been elected to the board :— **Messrs. E. D. E. Andrewes, T. J. Boulstridge** and **P. Grove.**

At the dinner terminating the Ediswan district managers' sales conference at the Piccadilly Hotel on 31st January, **Mr. W. J. Locke,** manager of the Brighton office, received a presentation marking his service of fifty-four years with the company. Mr. Locke chose a pair of binoculars, and the presentation was made by Mr. H. Butterworth, managing director. Mr. Locke started work in the Ponders End factory of the Edison & Swan United Electric Light Co., Ltd., as it was then, in 1896. At the end of the 1914-18 war, during which he was seconded to the Ministry of Munitions, he returned to the company and was appointed joint manager of the London office with Mr. Mumford and, later, with Mr. T. S. Read. He was appointed manager of Brighton district office in December, 1927.



Mr. H. Butterworth (right), managing director of the Edison Swan Electric Co., Ltd., making a presentation to Mr. W. J. Locke, Brighton office manager

Mr. A. Sargent, who retired from the position of works manager at the Helsby Works of British Insulated Callender's Cables, Ltd., at the end of January, has been presented with a radio receiver.

Mr. E. J. Napier, export liaison officer of Electro-Hydraulics Ltd., sailed for Canada on 14th February, to become manager of the firm's new subsidiary company, Conveyancer Fork Trucks (Canada), Ltd. Before joining the firm ten years ago, Mr. Napier was with the Metropolitan-Vickers Electrical Co., Ltd.

Mr. H. E. Hill has resigned from the board of British Moulded Plastics, Ltd., and its associates as from 30th January last.

Dr. A. T. Bowden and **Mr. J. L. Jefferson,** of C. A. Parsons & Co., Ltd., have been

awarded the Thomas Hawksley Gold Medal by the Institution of Mechanical Engineers for their paper entitled "The Design and Operation of the Parsons Experimental Gas Turbine," the best paper submitted during 1950.

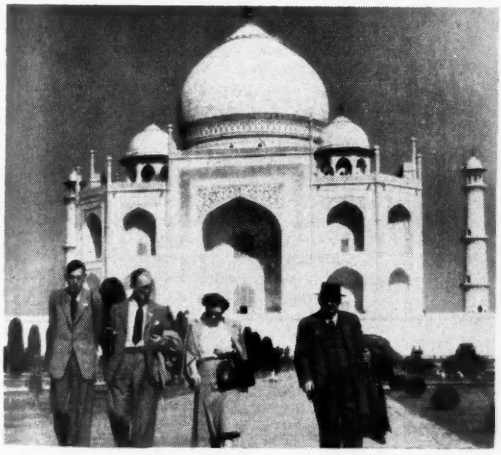
Mrs. E. D. Johnson presenting the prizes at the recent annual sports of the Indian Cable Co., Ltd.

The annual sports of the **Indian Cable Co., Ltd.**, were held on 21st January on the factory recreation ground at Tatanagar, Bihar, India. The heats had been run off the previous Sunday and the finals absorbed the interest of several thousand spectators. The individual championship cup was won by S. M. Dutta (clerk in the Drum Shop) and the departmental trophy was won by the General Office. A special trophy presented by British Electric Stores was won by R. M. Thampi (typist, General Office). After tea, the prizes and trophies were presented to the winners by Mrs. E. D. Johnson.

We have received a photograph, reproduced herewith, of some of the delegates to the Indian Engineering Congress. It was taken during a visit by the party to the Taj Mahal, Agra.

The president of the South Wales Institute of Engineers for 1951 is **Professor W. Norman Thomas**, C.B.E. **Mr. H. Coope**, M.I.E.E., is vice-president.

Delegates to the Indian Engineering Conference: Left to right: Mr. S. Chaplin (Enfield Cables, Ltd.), Mr. G. W. O. Turner (assistant engineer-in-chief, Ministry of Works, New Zealand), Mrs. McLaughlin and Dr. T. A. McLaughlin (Irish Electricity Supply Board).



OBITUARY

Mr. Arthur William Lay, B.Sc., A.M.I.E.E., F.Inst.P., whose death occurred on 3rd February at the age of fifty-eight, was well known for his work in medical physics and electronic instrumentation, research, design and development and enjoyed a world-wide reputation for his work in electro-medical metering. He was educated at Birkbeck College (University of London), the Regent Street Polytechnic and Northampton Engineering College. He joined Marconi's Wireless Telegraph Co., Ltd., in 1924 as a draughtsman and later spent over twenty years with that company, working in the field of diathermy. His first patent was taken out in 1933 and many of his designs are now used by the Marconi Instrument Co., at St. Albans. In June, 1948, he opened his own laboratory (the Lay Laboratory) at Galleywood and, helped by two assistants, continued his research in diathermy. Mr. Lay was a consultant to many hospitals. At the time of his death he was planning to extend his laboratory

and intended to work in atomic physics as applied to medicine and industry in collaboration with the Marconi companies.

Mr. M. A. Wills.—The death occurred on 28th January, at the age of forty-nine, of Mr. Maurice Alan Wills, who had been senior assistant engineer in the Transmission (Construction) Department, North Western Division of the British Electricity Authority since June 1948. Before this he was section engineer in the Preston section of the Transmission Department, a post which he had held since 1931 under the Central Electricity Board. Mr. Wills was trained in the G.P.O. Engineering Department at Southampton, and took a course of study at the Southampton University College. In 1918 he joined the Pirelli-General Cable Works, Ltd., as cable tester and became site engineer in charge of contracts, being put in charge of estimates and design in 1929.

Mr. Samuel Hepworth, director and founder member of Hepworth and England, Ltd., Batley, and a past chairman of the West Yorkshire branch of the Electrical Contractors' Association, died on 1st February.

Mr. A. T. Walker.—The death has occurred of Mr. A. T. Walker, who represented Falk, Stadelmann & Co., Ltd., in Scotland, and during part of his career in Northern Ireland, for many years. Mr. Walker joined the company in 1908.

Mr. F. Panter, first works manager of Erskine, Heap & Co., Ltd., has died at the age of eighty-six. He held that position from 1905 until his retirement in 1931.

Mr. D. B. Mellis, who also joined Erskine, Heap in 1905, has died at the age of seventy-five. He started as head of the Contracts Department, and in 1913 became one of the original directors when the concern became a limited company. From that time until his retirement in 1929 he was chief electrical engineer.

Mr. A. B. Holmes, who retired from Siemens Electric Lamps & Supplies, Ltd., in 1941, died recently in his 74th year. Mr. Holmes entered the service of Siemens Bros. & Co., in 1889 and, after progressively serving in various capacities, was made chief commercial assistant in the newly created Lamp Department in 1908, first at Westminster and subsequently at Dalston and Upper Thames Street. In 1926 he was appointed manager of the London sales area of Siemens Electric Lamps & Supplies, Ltd., a position which he held until his retirement.

Sir Allan Gordon-Smith, K.B.E., D.L., chairman of the Smith group of companies, which includes Smith's English Clocks, Ltd., died on 12th February at the age of seventy. Sir Allan was the original managing director of the Smith group, a position he held until two and a half years ago. The electric clock business, which was commenced in 1930, grew out of the organization's interests in automobile and aviation instruments. Sir Allan, who was knighted in 1939, was chairman of the National College of Horology and a director of Electric & Musical Industries, Ltd.

Mr. Edward Balmford, whose death occurred on 9th February at the age of sixty-six, had been associated with the National Gas & Oil Engine Co., Ltd., since 1901. He was a nephew of the founder of the company and was mainly concerned with the sales side, travelling abroad extensively.

Mr. W. W. Kublin, managing director of the Britannia Electric Lamp Works, Ltd., died suddenly on 2nd February. Mr. Kublin was only forty-eight.

Mr. Thomas Potts Easton, former general manager of the transport and electricity undertaking of Newcastle-on-Tyne City Council, has died at the age of seventy-five. He retired in 1941.

WILLS

Mr. H. Tinsley, founder of H. Tinsley & Co., scientific instrument makers, South Norwood, who died in October last, left £24,320 gross (£24,137 net). After a number of bequests he left the residue of his estate upon trust for his wife and then to the Imperial College of Science and Technology, for scholarships or for endowing a hall of residence.

Mr. W. A. Burton, of Hove, Sussex, for many years chief purchasing officer to Allen West & Co., Ltd., who died on 27th August last, left £21,700 gross (£21,464 net).

Mr. T. P. Wilmshurst, M.B.E., M.Inst.C.E., M.I.E.E., an Electricity Commissioner from 1926 to 1935, who died in October last, left £22,388 gross (£22,306 net).

Future of the B.S.I.

THE report of the Board of Trade Committee on the organization and constitution of the British Standards Institution is now available from H.M. Stationery Office, price one shilling. The main conclusion is that the B.S.I., as it now is, is generally well adapted for carrying out its present work. The increased work which it may be called upon to do in the near future will, however, necessitate a larger income. An increase of expenditure is foreseen which may well be double the present sum of £200,000 a year within the next five years. The Committee therefore suggests that more income should be obtained from present sources and that a contribution equal to the members' total subscriptions should be made by the Government.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Plan to Save Coal

COAL is Britain's most valuable mineral asset, upon which the existence of her industries and population depends. This wasting asset is irreplaceable; the reserves of "workable" coal are fast diminishing while, at the same time, the rate of consumption is increasing. The drift of manpower from the mines into cleaner, more healthy and less dangerous occupations is perturbing. It is largely due to the disheartening task of the face workers who have first to drill the coal from the seam, then blast the hard rock to enable them to continue boring, thus mining large quantities of rock to win coal from the thinner seams which remain as most of the good seams are worked out.

The National Coal Board proposes to spend £635 million in order to increase the annual output of coal to 240 million tons by 1961, including 35 million tons yearly for export. By doing so the N.C.B. will hasten the depletion of workable reserves and perpetuate the present, in many cases, wasteful use of coal.

The most urgent national need is for a plan to save raw coal. It should aim at the reduction, progressively, of the annual output to 140 million tons by 1961. That total would include 15 million tons for the export trade, which is slowly dying; it may cease within ten years, in which case the annual output of coal would be further reduced. Products made from derivatives might be exported instead of raw coal and greater annual revenue would be obtainable.

Let us therefore use, say, half the money which the N.C.B. proposes to spend, but on the initiation of projects to save coal, such as the electrification of more railways and steam winders at collieries, extending the use of smokeless fuel in domestic and commercial premises, improving the efficiency of industrial processing and the avoidance of fuel wastage in factories generally. The value of the coal conserved by economies that could be effected in these and similar ways, as well as by the use of alternative sources of power—if initiated quickly and pursued with vigour—would more than off-set the cost of putting into operation a plan to save coal, which is of greater urgency than the N.C.B. plan to get more coal.

Twickenham, Middlesex. W. WAKEFIELD ADAM, M.I.Mech.E., M.Inst.F.

Economical Loading

WITH reference to Mr. N. Don's article on "Economical Loading" (19th January) I would point out that my article (9th December, 1949) laid down the basis of the subject which is fundamental and is, in fact, applied, in a modified form, throughout the B.E.A.'s system. Mr. Don's method is a return to the old "cut and try" process in which both the running order and loading order are decided together and involves examining every possible plant and loading combination and selecting the most economical by inspection.

It must be emphasized that once the basic data have been tabulated and providing that the machine incremental rates increase with increasing load, which is the case with turbines, the method of incremental loading will always give the correct load allocation between machines already in service, without any calculation; it will not decide the total number of machines to be in service for a given load.

The principle involved in deciding the number of machines to be in service to meet a given load is quite simple; the number of calculations, however, is prodigious although arithmetically straightforward. The speed at which these calculations can be performed decides whether, or not, approximate solutions are to be adopted. On the B.E.A.'s system approximate solutions are used, largely due to the quality of the basic data and the number of machines involved. When testing departments finally provide accurate data for all stations there appears to be no reason why an electronic digital computor should not

be used to provide a rapid solution to the entire problem.

In the case of the machines considered in Mr. Don's article, incremental loading would be difficult to apply, owing to the extraordinary characteristics of all of them except machine A, which is the only one with the normal characteristic of a steam turbine. If the figures in the tables are plotted graphically, all machines except A and D have decreasing incremental rates with increasing load and have most unusual steam rate curves. With turbines having the usual type of input/output characteristics, the B.E.A.'s System Operation Department has developed various approximate methods which are much simpler to use and retain the fundamental principles of incremental loading far better than the method advocated by Mr. Don. I have no doubt that you will be hearing of them in due course.

In conclusion, it is necessary to point out that in the case of a feed heat system, load allocation based on turbine steam rates would be grossly misleading and for the purpose of loading several stations on a large system, cost rates must be used.

Bramcote, Notts. G. OLDROYD.

First "Tube" Railway

THE letter from Mr. McMahon in your 12th January issue gives interesting additional details of the early locomotives for the City and South London Railway. There is a complete and one would suppose authoritative list of the engine numbers related to builders in "Handling London's Underground Traffic" published in 1928 by Mr. J. P. Thomas, the then operating manager of the Underground. He gives the following references:—Nos. 1–14, Mather & Platt, Ltd.; Nos. 15–16, Siemens Bros. & Co., Ltd.; No. 17, built at Stockwell; No. 18, Crompton & Co., Ltd.; No. 19, Electric Construction Co., Ltd.; No. 20, Thames Ironworks, Ltd.; Nos. 21–22, built at Stockwell; Nos. 23–32, Crompton & Co., Ltd.; Nos. 33–42, Crompton & Co., Ltd.; and Nos. 43–52, Crompton & Co., Ltd.

On the other hand, Mr. H. W. A. Linecar in his "British Electric Trains" refers to the early locomotives being built by Mather & Platt, Ltd., and Beyer, Peacock & Co.

It would be interesting to know the horse-power of the early Mather & Platt locomotives. When the line was closed for reconstruction there were, according to Mr. Thomas, 44 locomotives still in service. Of these it appears that 31 were Crompton direct drive 150 h.p. locomotives, which seem to have run throughout, 10 were geared Mather & Platts of 160 h.p., two more, probably built by the Railway, were also of 150 h.p., while there was one, presumably that of the Electric Construction Co., with the surprising rating of 250 h.p. This suggests that the brunt of the work was borne by the Crompton locomotives, that is, the gearless type, rather than the geared locomotives to which Mr. McMahon refers.

Incidentally Mr. Linecar refers to the locomotive (No. 18?) on exhibition at Moorgate Station. A year or so ago this was still in position but in a deplorable surface condition. No doubt this has been remedied by now. If not perhaps you could use your good offices to see that this famous veteran presents a braver front under at least a new coat of paint during this Festival year.

Maldon, Essex. A. A. MORRIS.

Power Factor

THE suggestion in your editorial of 2nd February that the B.E.A. Productivity Team did not consider the study of American methods of power factor correction of importance does, I feel, need a reply. No detailed reference was made to American practice in the report as it was felt in this instance, as in many others, that the practice there could not be usefully employed in this country.

Power factor correction equipment has been and is being installed on a very widespread scale by electricity undertakings in America on main transmission and high and medium voltage distribution systems. The conditions are very different from those in this country. Typical industrial tariffs are shown on pages 122 and 123 of the report and it will be seen that economic pressure on consumers to improve power factor is less than in this country where the kVA maximum demand tariff is generally favoured.

Section 341 of the report refers to the widespread use of capacitors on suburban overhead distribution lines to counteract the effect of the very heavy single-phase domestic motor load. The comparatively

small domestic motor load has not fortunately given rise to any similar problem in this country and therefore the practice has not been described in detail.

I think it can be said that, in general, in this country the provision of sufficient capacity on Area Board systems to meet the comparatively high power factor winter peak loads caused by the large proportion of heating and lighting enables the lower power factor summer loads to be dealt with adequately. I do not think, however, that the same can be said in respect of the B.E.A. main transmission systems in which case low power factor is a serious problem in the summer when plant is taken out of commission for overhaul. The adoption of the 275 kV system for transmitting power over long distances might well justify consideration of synchronous condensers, which have been found worth while in such circumstances in the States, but such considerations were felt to be beyond the scope of the report.

Halesowen. R. MALLET.
(*Member of the Productivity Team.*)

ONE section of your editorial comment (2nd February) on the above subject is not understood. Surely, if charges are based on kVA demanded there is a very direct positive inducement to improve power factor? This can be made manifest to the consumer, if the expense is warranted, by also having a kW demand indicator, so that he can see for himself what his poor power factor is costing him.

If you will refer to pages 122 and 123 of the Anglo-American Productivity Team's report, you will observe that the practice pursued by one American undertaking is cited. That undertaking allows credits (which will probably appear small in British eyes) for power factors better than 0·75 in accordance with a scale and the power factor is determined as an average over the billing period. Judging from observations made in the various undertakings visited, it would appear that there is no standard American practice in this matter any more than there is a standard British practice. It would, therefore, in my opinion, be true to say that comparatively little is done in America to put economic pressure on consumers to improve their power factor.

The Americans have the problem, fortunately not prevalent in this country, of a heavy single-phase domestic motor load, which is dealt with in Section 341 of the report.

I hope I have said enough to dispose of your suggestion that the Team neglected to inquire into power factor improvement.

Edgware, Middlesex. H. S. PETCH.
(*Member of the Distribution Productivity Team.*)

Rural Electrification Costs

THE question of meeting the cost of rural electrical development which is likely to prove unremunerative to the supply authority is undoubtedly more acute in India than it is in this country.

The Association of Electrical Undertakings, Bombay Province, is concerned in this matter because Government representatives have recently reproved electricity supply companies for catering only for commercial and industrial districts and have stressed the need for extending electricity supplies to rural areas. But, says the Association, they have all been "eloquently silent on the economics of rural electrification."

It quotes at length, and with approval, the leading article on this subject which appeared in the *Electrical Review* of 17th November last, and it also mentions the view expressed by the Association's president, Mr. Noel Paton, that it had to be recognized that rural electrification in India was going to be costly except in concentrated areas. He did not favour the idea of rural development being financed by industrial loads (a point referred to in the *Electrical Review's* leading article) as this would affect the capacity of industry to compete and thus adversely affect production. Mr. Noel Paton came to the conclusion that an acceptance of the principle of subsidies for this purpose was inescapable.

I.E.E. Southern Centre

THE annual dinner and dance of the Southern Centre, Institution of Electrical Engineers, will be held on 8th March at the Polygon Hotel, Southampton. Tickets, 17s 6d each (student's single ticket 12s 6d), can be obtained from Mr. L. H. Fuller, hon. secretary of the Centre, 82, St. Thomas's Street, Old Portsmouth, Hants.

Sydney Development Halted

Plant and Fuel Problems

THE Sydney County Council supplies electricity, directly or in bulk, to 1¼ million inhabitants of New South Wales, or roughly a seventh of the total population of the Commonwealth. It is a large purchaser of electrical equipment, much of which is obtained from Great Britain, and its activities are therefore of especial interest in this country.

Following the war, load development was greatly accelerated, averaging 13 per cent annually, but delays in the completion of power projects because of adverse conditions brought on an increasingly acute plant shortage necessitating restrictions which concealed the true rate of increase in demand.

Construction of the Pyrmont " B " station, with an ultimate capacity of 200,000 kW, and for which first contracts were placed in the autumn of 1944, was expected to provide an amelioration of these conditions some time ago, but the project has been so delayed that the first 50,000 kW set is not expected to be ready until later this year. Slow erection of steelwork, and a general shortage of labour, have latterly been the chief causes of delay. To expedite steelwork fabrication the final section was changed from riveted to welded construction, which has also been adopted for the 50,000 kW extension in hand at Bunnerong " B " power station.

A third scheme which the Council has in hand is the building of a further new station—Lugarno—on the southern bank of the Georges River, the ultimate development visualized being 300,000 kW. The Council is also co-operating with the Department of Railways in a scheme for the construction of a 132 kV transmission system.

Industrial Supplies Suspended

The latest report received from the Council relates to the year 1949, but a foreword by the general manager, Mr. G. S. Boyd, brings the account up to the beginning of July last. It tells of one of the most difficult years in the authority's history, when a general strike in the coal mines brought industry in the State to a standstill. For eight weeks, with a few essential exceptions, there was a complete ban by the N.S.W. Government on the use of electricity for industrial purposes, while other supplies were limited to brief periods. This, together with restrictions made necessary by plant shortage during the remainder of the year, is estimated to have deprived the Council of £566,000.

Moreover, because large quantities of fuel oil were burned to supplement coal supplies, fuel costs were £512,315 higher than in the previous year. These and other factors outside the Council's control resulted in a trading deficit for the year of £817,813, although tariffs were raised by 16 per cent at the beginning of the year. With the prospect of still higher labour and material costs, further tariff increases have now been introduced.

Sales of electricity in 1949 totalled 1,112 million kWh, a decrease of 4·7 per cent—the first in the Council's history. To keep output as high as possible a continuous shift system of plant maintenance was operated.

Sales promotion activities were naturally curtailed. Nevertheless the Council's advisory service co-operated with local manufacturers in a number of interesting installations, among which may be mentioned a " toggle frame " dryer for sheep skins consisting of thirty-six cells 1ft by 13ft by 10ft high heated by a 180 kW electric steam generator supplying 350 lb of steam an hour. Other installations included five 42 kW ovens for " baking " complete motor car bodies, a 90 kW conveyor type oven for bicycles and a model bakeroom for bread research.

Group-Delay Measurement

PHASE distortion is present in all telecommunication transmission systems, but is not noticeable in carrier-telephone or music circuits because even large distortions in phase cannot be detected by the human ear. In television transmission systems, however, phase distortion becomes of paramount importance because its effect can be seen on a television screen and its accurate measurement is therefore a necessity. Two sets of equipment for measuring phase distortion have already been designed and made for the G.P.O. by the General Electric Co., Ltd., for use on the London–Birmingham television radio-relay link. The Birmingham–Manchester and London–Cardiff coaxial-cable television links, for which the G.E.C. is supplying the repeater-station amplifiers, will soon be undergoing initial tests, and a further set of eight phase measurement equipments has been ordered.

Each equipment will provide direct-reading measurements of the group delay of a 120 kc/s band in the vision-frequency bandwidth, the measurements being made to an accuracy of 0·005 μsec. A pilot comparison frequency is transmitted through the system so that the equipment could be used on systems with terminal stations several hundred miles apart.

Electrical Research

E.R.A. Annual Meeting and Report

THE thirtieth annual general meeting of the British Electrical and Allied Industries Research Association was held at the Connaught Rooms, London, on Friday last.

Mr. H. Astbury (chairman of Council) presided and in proposing the adoption of the annual report with the statement of accounts referred briefly to two matters of finance. The fresh agreement now being negotiated with the Department of Scientific and Industrial Research for larger grants-in-aid meant that the E.R.A. must increase its grant-earning income from industry. The date of settlement had been deferred for one year to 30th September, 1951.

After pointing out members' responsibilities in this respect the chairman mentioned that the Council had now agreed on the plans for the projected laboratory buildings on the Leatherhead site, which would offer better scope for the work of the Association; in due course members would be asked to assist in financing the scheme.

Lord Citrine (chairman, B.E.A.) has accepted the presidency for a second year. The following were elected to fill Council vacancies:—Prof. J. Greig in place of Mr. P. V. Hunter (retired) and Mr. S. B. Warder in place of Mr. C. M. Cock (resigned) while the following (due to retire by rotation) were re-elected: Messrs. J. S. A. Bunting, H. F. Carpenter, A. R. Cooper, L. J. Davies, N. R. Elliott and C. T. Melling.

Luncheon Speeches

Sir John Hacking (B.E.A.) presided at the luncheon afterwards, deputizing for Lord Citrine (at sea on his way home from India) from whom a cablegram of good wishes was received.

Sir Archibald Gill (president, I.E.E.) proposed the toast of "The E.R.A.", remarking that it gave him pleasure to do so because of the long association of the Institution with the Association; in fact the I.E.E. had been prominent in the inauguration of the E.R.A. He looked back at the quantity and quality of the work done by the E.R.A. with so much benefit to industry and in co-operation with the G.P.O. The contributions it had made to international conferences had put research in this country "on the map" of the world. The new financial arrangement being made with the D.S.I.R. was a challenge which Sir Archibald was sure would be met without difficulty.

Cost of Leatherhead Project

Sir John Hacking responded with the observation that the future of this country would depend on the standard and quality of its exports which, in turn, would depend on research. Manufacturers were now conducting research on a scale probably greater than that of the E.R.A., but that fact did not remove the need for a larger central organization which, if it became well known to foreign customers, could have a great propaganda effect in the field of export.

It was the intention of the B.E.A. to extend its own research effort, but it realized that such effort must be supplementary to that of the E.R.A., even on an extended scale of support, which was in line with the policy of manufacturers.

Sir John pointed out that more laboratory accommodation was becoming urgent. The estimated cost of buildings and equipment for the Leatherhead project approximated to £400,000, which was very much less than the original idea, but allowance would be made for further expansion later on. The D.S.I.R. was to contribute, and the reserve funds were available, but the E.R.A. must also have grants-in-aid for work to be done. The Area Boards and the manufacturers were eager; direct discussion was proceeding to determine whose job it was to find a substantial sum of money. If the D.S.I.R. was to provide 40 per cent more, then it would call for a 70 per cent industrial contribution.

Mr. H. Astbury proposed the health of

the president and his deputy, to which Sir John responded.

A meeting of the Council followed after luncheon.

Report for 1949–50

The annual report for the year ended September, 1950, shows that relief of financial stringency has only been temporary. In spite of economy and the deferment, or reduction, of many well supported requests for research the Association has had to work to the full limit of its income.

Wind power studies are being extended in Britain; also to Northern Ireland at the request of the Ministry of Commerce and to Donegal with a special contribution from the Eire Electricity Supply Board. The E.R.A. has taken a leading part in international co-operation on this subject —O.E.E.C.—while Electricité de France is investigating along similar lines. New measuring instruments have been developed and much equipment specially designed.

A plan is now complete for a full-scale trial of the high voltage d.c. transmission of power; meanwhile the model system (*Electrical Review*, 16th June, 1950, p. 1194) has enabled four reports to be drafted on the starting of an h.v. d.c. line, the hunting of compounded rectifiers and invertors and the operation of invertors with natural commutation near the reactive kVA minimum condition.

The investigation of lightning has become nation wide by the recruitment of voluntary observers and collaboration with the Area Boards. Maps of thunderstorm locations are prepared and an attempt to photograph lightning in daylight is envisaged.

The hydrogen-oxygen cell has reached a stage at which any further major advance will need a higher scale of effort. The complete specification of a patent application covering a design feature was filed on 5th September, 1950.

With the support of the Ministry of Agriculture and Fisheries the Shinfield experimental station near Reading is being expanded by the building of full-scale glass-houses and a new laboratory; the latter will be warmed by a heat-pump for comparison with a more orthodox system. A novel electrically driven pneumatic elevator for barn hay drying can now be confidently recommended; full-scale trials will show whether the Swedish system is suitable for drying hay in the wettest areas of the country.

The all-electric grain dryer has been modified; its low electric loading and other features are expected to interest manufacturers of such plant. Work on the drying of other agricultural materials is being assisted by a large seed-growing farm and by the staff of the Cereals Research Station at St. Albans.

A small electric tractor for market garden cultivation operations has been shown to be generally satisfactory for a five-acre plot, but a more suitable design of connecting power cable is needed. Calculation of the size of a lead-acid battery to do the same work showed that it would occupy 2 cu yd, weigh 2·5 tons and cost £800.

The use of electrical methods by fisheries is being studied; also the effects of high frequency on bacteria in co-operation with the National Institute for Research in Dairying as well as possible h.f. control of pests in biological materials. The air-conditioning of a battery laying house in the poultry section of Reading University farm has been brought into operation.

The success of the pilot network analyser suggests that its extension to full scale may involve heavy capital expenditure before long. Fundamental switchgear research continues as well as the elucidation of dielectric breakdown phenomena, including insulating oils; stresses and strains in cables and the properties of overhead line accessories.

Further technical assistance is being rendered to the G.P.O. in connection with the minimization of interference with communication and radio services.

Assistant Director Appointed

Disputes in the printing trade account for the unusually small ratio of reports issued to those which are in an advanced stage of preparation. Liaison, especially with smaller manufacturers, has been extended and the information bureau and library have dealt with a much greater number of inquiries than usual.

The staff numbers 292 and Dr. W. B. Whitney, head of the Switch and Control Gear Department, who has been with the E.R.A. for thirty years, has become an assistant director to relieve Dr. S. Whitehead of some aspects of technical administration and to take over certain responsibilities in the director's absence.

Commerce and Industry

Cable Makers' Wages

International Rubber Position

THE Joint Industrial Council for the Electrical Cable Making Industry announces substantial increases in wages for all workers in the industry. Time rates have been raised by 2d an hour (7s 4d a week) for adult male employees and by 1¾d an hour (6s 5d a week) for adult female employees, with proportionate advances for younger workers.

Similar increases are given to payment-by-results workers and it is provided that piecework rates shall be such that in normal circumstances a worker of average ability will be able to earn 10 per cent more than the new time rates. Where existing systems ensure this it is not intended that there shall be any adjustment in prices or bonus times. Payment-by-results workers will not receive higher bonus earnings as a consequence of the advances in time rates.

The new agreement takes effect as from the third pay-day in February for the period covered by that day.

International Rubber Conference

The Board of Trade Journal reports that an inter-governmental Rubber Conference was held in London last week. Delegations representing Canada, Ceylon, France, Indonesia, Italy, the Netherlands, Thailand, the United Kingdom, the British Colonial and Dependent Territories, the United States and Vietnam were present. The Conference elected Sir Gerard Clauson, Colonial Office, as chairman, and Signor Alberto Pirelli, Minister Plenipotentiary of Italy, and Sir Oliver Goonetilleke, Ceylon High Commissioner in London, as vice-chairmen. The purpose of the Conference was to review the present and prospective supply-demand position of natural and synthetic rubber and to consider, in the light of the conclusions reached, whether any agreed recommendations for international action should be submitted to Governments, due regard being had to the interests both of the producers and of the consumers.

A cooker display prepared by the Revo Electric Co., Ltd., which is now appearing in a number of showroom windows

Lifts and Power Cuts

The Council of the National Association of Lift Makers advises lift owners that the only way of preventing damage to lift equipment during periods of reduced voltage is to disconnect the lift from the electricity supply by opening the main switch or circuit-breaker. The lift should not be reconnected until the supply voltage rises above the statutory minimum.

Discussion on Productivity

An open meeting is to be held at the Connaught Rooms, Great Queen Street, Kingsway, London, W.C.2, on 27th February, at 2.30 p.m., to give an opportunity for manufacturers in the motor control gear and small air-break switch industries, and members of their staffs concerned with production and allied problems, to meet members of the Productivity Team which visited the United States last year, under the

auspices of the Anglo-American Council on Productivity, and discuss with them their report and conclusions.

Mr. E. C. Holroyde (vice-chairman, Crompton Parkinson, Ltd.) will preside and the report will be presented by Mr. J. R. Walton (managing director, Electrical Apparatus Co., Ltd.), the leader of the Team. The meeting is being organized, on behalf of the Team, by the British Electrical & Allied Manufacturers' Association, 36, Kingsway, London, W.C.2, from whom further information and copies of the Team's report (price 2s post free) can be obtained.

Festival Electricians' Strike

Although the electricians engaged on the Festival of Britain site in London decided to return to work after striking for an additional 2d per hour a large proportion of them again ceased work last week. The Minister of Labour has set up a committee of investigation, under the chairmanship of Lord Terrington, to inquire into the causes and circumstances of the dispute.

The committee reported promptly. It stated that the necessity for speed to ensure the completion of the work upon time justified the extra payment demanded by the men. It therefore recommended that they should be paid an additional 2d an hour as from 26th January. Regret was expressed that the men should have resorted to an unofficial strike. Upon the announcement of the committee's findings the electricians decided to resume work on Tuesday last.

Export of Iron and Steel Goods

The Board of Trade announces that from 12th February the export of iron and steel goods under open general licence will be permitted only if the value exceeds the value of the iron or steel content, calculated at £21 per ton.

This licence applies to iron and steel goods specified in Group 6 (2) of the First Schedule to the Export of Goods (Control) (Consolidation) Order, 1950. Under a previous similar licence, which is revoked, the value was £16 16s per ton. Exporters' inquiries regarding this licence should be made to the Export Licensing Branch, Board of Trade, Regis House, King William Street, London, E.C.4 (telephone : Avenue 3111).

Engineering Piecework Ban

We reported last week that workers in the engineering industry who were refusing to undertake piecework because of their dissatisfaction with the recent engineering wages award had decided to lift their ban pending discussions upon the subject between the employers and the trade unions. On 9th February workers at the Trafford Park works of the Metropolitan-Vickers Electrical Co. voted in favour of continuing the ban until piecework rates were raised.

Lamp Display Unit

The accompanying illustration shows the new two-piece display unit which Ekco-Ensign Electric, Ltd., has just produced for the South Eastern Electricity Board, which is now being displayed on a rota in the Board's Service Centres.

The units are well constructed and attractively finished. The main unit (approximately 5ft high) has been designed to illustrate the theme of the Ekco-Ensign press and film publicity "Perhaps you need a better light" utilizing a fully coloured enlarged photograph of a shot from the film. Originally intended to be illuminated, it has had to be modified to fall in line with the new lighting restrictions. This also applies to the attractive second unit which shows a range of actual lamps all wired ready for switching on.

Ekco-Ensign two-piece display unit designed for the S.E.E.B.

Protest Against Coal Price Increase

In a letter to Mr. P. J. Noel-Baker, Minister of Fuel and Power, Sir Norman Kipping, director-general of the Federation of British Industries, says that the Fuel Consumers' Committee of the F.B.I. wishes to express in the strongest terms the concern it feels at the further rise in the price of coal. Other industries have proved that by increased productivity costs can be kept down below the levels that otherwise would have been necessitated by rises in the cost of imported materials.

Undertakings have now been given for an increase in output of coal. In the face of this, it is felt precipitate to assume that the coal industry cannot do the same as other industries, and to raise the price before the undertakings have been given time to take effect.

The added burden represented by the rise in price is equivalent to more than £50,000,000 a year. All British industry is founded on coal, and this rise in price will add to costs everywhere. Increases in coal output per man would materially reduce, if not cancel, the need to raise from consumers this enormous sum. In any case, in reverting to a flat rate increase, the National Coal Board has departed from its undertaking to relate the price in future to grade of coal. Firms that have bought plant to burn cheaper grades are thus most unfairly victimized. The F.B.I. asks that immediate steps be taken to reconsider this price increase and the manner in which it has been imposed.

P.M.G. Visits G.E.C. Works

The Postmaster General, Mr. Ness Edwards, with his Parliamentary Private Secretary, Mr. R. Winterbottom, recently accepted an invitation from the General Electric Co., Ltd., to visit its research laboratories and works. He saw the complete scheme of development work for cathode ray tubes at the research laboratories at Wembley and afterwards examined the production facilities at the works at Perivale. Mr. Ness Edwards afterwards expressed himself as glad of the opportunity to discuss in some detail the larger technical problems of development and production and also to exchange views with Sir Harry Railing, chairman of the G.E.C., on the broader question of television.

At the G.E.C. works, Perivale: Mr. W. J. A. Woodward (G.E.C.), Mr. E. R. Gant (G.E.C.), Mr. Ness Edwards (P.M.G.) and Mr. R. Winterbottom (Parliamentary Private Secretary to P.M.G.)

Industrial Administration Conference

The London Centre Council of the Institute of Industrial Administration is holding a week-end conference from 9th to 11th March for directors and managers of firms employing fewer than 250 persons. The conference, which is being held at St. Ermins Hotel, London, S.W.1, will discuss the problems which confront directors and managers of smaller firms. It will be residential and is limited by reserved accommodation for fifty persons. It may, however, be possible to admit a few non-residential members at a slightly reduced fee. Particulars of the conference can be obtained from the hon. secretary, I.I.A. Conference Committee, 72, Chester Road, London, N.17. Should the number of applications exceed the accommodation, another conference will be held at a later date at which unsuccessful applicants will be given preference.

Navigation Aids for Pakistan

The Royal Pakistan Air Force has ordered from Marconi's Wireless Telegraph Co., Ltd., three v.h.f. direction finders, Type AD.200, for use as navigational aids on air stations in Pakistan. This automatic direction finder is a ground equipment which provides instantaneous bearing indication of two aircraft transmitting simultaneously on different frequencies in the 118 Mc/s to 132 Mc/s band.

Future of B.E.A. Premises

The Liverpool City Council has refused to allow the British Electricity Authority to use Lower Lee, Liverpool for conversion into head-

quarters for the Merseyside and North Wales Division. Lower Lee is a mansion which has twelve bedrooms and four entertaining rooms and stands in about 6½ acres of ground. Two petitions have been presented to the City Council respecting this property. One of them from Woolton residents expressed resentment against the B.E.A. proposal for the reason that the site is within an area zoned for residential purposes.

Commercial Travellers' Schools

The 1950 festival appeal for the Royal Commercial Travellers' Schools raised £44,500. This result was announced during the festival dinner of the Schools held at Grosvenor House on 26th January under the presidency of Lt.-Col. M. W. Batchelor, J.P. The total as first announced amounted to £43,268, but during the evening Mr. L. Gamage (vice-chairman and joint managing director, General Electric Co., Ltd.), added £981 which, with a contribution by Lt.-Col. Batchelor, brought the total to the final figure. Other contributions received included £620 from the Electrical Trades Commercial Travellers' Association. Proposing the toast of the Royal Commercial Travellers' Schools, Sir George Kenning said that nearly 5,000 boys and girls had passed through the Schools which cost over £50,000 a year to run, without any State assistance. Mr. Gamage, in responding, announced that the board of management had decided to go ahead with the repair and renovation of the buildings. The work would cost a great deal of money and he would like to put the maintenance target in the region of £60,000 or £70,000 a year.

Fluorescent Stage Lighting

The Royalty Theatre, Chester, is the latest theatre to be equipped with "Atlas" fluorescent stage lighting supplied by Thorn Electrical Industries, Ltd. The installation was carried out by David Rowan (Vidro), Ltd., working under the supervision of Thorn Electrical Industries.

Cromptonian Association

The annual dinner of the Cromptonian Association will be held on 1st June at the Trocadero Restaurant, Piccadilly Circus, W.1. Mr. H. H. Spencer, hon. secretary, Crompton House, Aldwych, London, W.C.2, will be pleased to hear from Old Cromptonians who are not members of the Association and particularly from those resident overseas.

Trade Announcements

Mr. F. J. Ashley has been appointed a technical sales representative for Ekco car radio. Mr. Ashley has been with **E. K. Cole, Ltd.**, since January, 1947, in the Development and Engineering Department.

From 1st March next the Leeds branch of **Thorn Electrical Industries, Ltd.**, will be operating from new premises at 35, Aire Street, Leeds, 1 (telephone : 29310).

Barlow & Young, Ltd., are removing on 19th February to larger offices at 55, Catherine Place, London, S.W.1. The telephone number will remain unchanged.

Catalogues and Lists

Linolite, Ltd., 158, Bishopsgate, London, E.C.2.—Leaflet on "Linoglas" internal reflection signs.

B. French, Ltd., 19-29, Woburn Place, London, W.C.1.—Illustrated brochure outlining some of the company's activities in the field of electrical contracting and describing the major installations made in recent years.

Siemens-Schuckert (Great Britain), Ltd., Faraday Works, Great West Road, Brentford, Middlesex.—Maintenance handbook on the type E 47 flameproof electric drill for coal and stone, which also includes spare parts list.

William McGeoch & Co., Ltd., Warwick Works, 46, Coventry Road, Birmingham, 10.—Illustrated catalogue of industrial, domestic and commercial lighting fittings and associated price list.

Nife Batteries, Redditch, Worcs.—Folder on a portable lamp for both fire brigade and industrial uses.

Richard Sutcliffe, Ltd., Horbury, Wakefield.—Illustrated brochure (in colour) on gate and trunk conveyor components.

Expanded Metal Co., Ltd., Burlwood House, Caxton Street, London, S.W.1.—Folder describing an industrial space heating unit.

Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, 17.—Thirteen technical folders on motors, starters, contactors, vehicle heater units, instruments and other industrial equipment.

Doran Instrument Co., Ltd., Stroud, Glos.—Four technical leaflets on a pH indicator, universal pH meter, miniature standard cell and miniature thermocouple potentiometer.

British Thomson-Houston Co., Ltd., 9, Langley Road, Watford Herts.—Priced and illustrated (with some colour) catalogue of lamps and associated accessories.

Simplex Electric Co., Ltd., Oldbury, Birmingham.—Folder on "Reflecto-flood" and other floodlighting equipment.

Lapointe Machine Tool Co., Ltd., Edgware, Middlesex.—Folder on the "V" range of vertical, variable speed, hydraulic pull down broaching machines.

Induction Motor Injection Braking

Selenium Rectifiers as a Convenient D.C. Source

By B. W. GLOVER, A.M.I.E.E.

THE method of braking induction motors by disconnecting the a.c. input and applying d.c. to two or more of the motor terminals has been known for a long time, but it does not appear to have been widely used until comparatively recently. The reason has been partly the difficulty of providing a suitable d.c. source. This obstacle can be conveniently overcome by the use of selenium rectifiers.

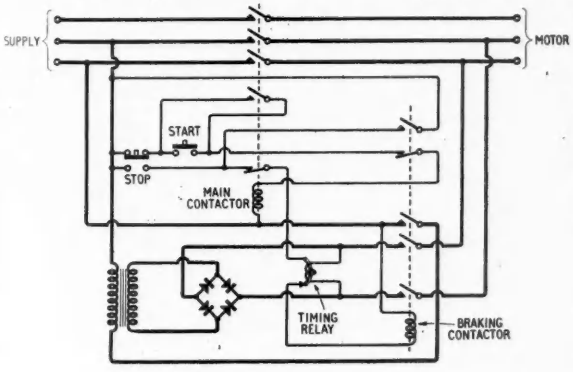
The general advantages of d.c. injection braking can be enumerated as follows[1]:—The system does not require any apparatus to be mechanically coupled to the motor shaft, as does a band brake for example. The motor cannot run backward, as may occur with reverse plugging. The rotor is free to be rotated manually when the d.c. is disconnected at the termination of the braking period (which could be a disadvantage in some cases). The time required to brake the motor is easily adjustable by simple variation of the injected d.c. Braking is very smooth. If the d.c. is supplied from a separate source, braking will be independent of mains supply failure. The energy (loss) dissipated in the rotor during braking is one-third of that when plug braking.

The four possible types of motor load that have to be considered are: (1) a dead weight load which has the effect of applying a braking torque as soon as the a.c. is disconnected; (2) a light load where the moment of inertia of the rotor is the controlling factor; (3) a load with appreciable flywheel effect; (4) a load which, under certain conditions, could tend to drive the rotor beyond synchronous speed, a lift or a mine cage for example.

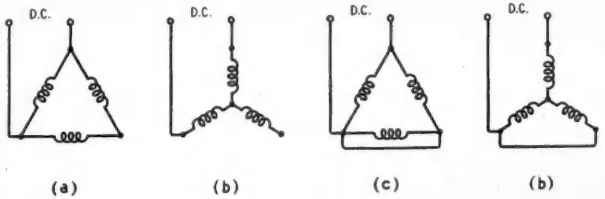
Loads of types 1 to 3 are very suitable for braking by means of d.c. injected into the stator. Different values of current are required to stop the rotor in a given time, being smallest for load type 1 and largest for load type 3.

Load of type 4 is a more specialized problem,[2] not within the scope of the present discussion. Simple d.c. injection into the stator of such a motor may not be entirely satisfactory; under certain conditions the motor may speed up instead of slow down. One satisfactory method of braking a motor loaded in this way is by means of d.c. applied to one phase of the stator at a fixed potential, while the a.c. generated in the rotor is rectified and fed back to the other phases of the stator at a potential depending upon the speed of the rotor[3, 4]. Selenium rectifiers have been used very successfully for a number of years to supply both magnetizing and compensating currents in this application.

Fig. 1.—Direct current injection braking circuit



The essential components of an injection braking circuit (Fig. 1) are a.c. and d.c. contactors, a selenium



Left: Fig. 2.—Stator connections for injection braking

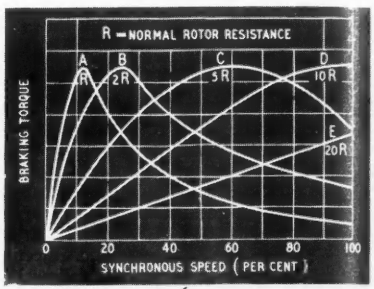
Below: Fig. 3.—Typical speed/braking-torque characteristic curves

rectifier with transformer and a timing device to cut off the d.c. after a predetermined time. The latter may be of the bimetal strip type, but other kinds would be equally suitable. A transformer is necessary because d.c. at low voltage is required.

The rectifier may be single-phase or three-phase, the choice generally being governed by relative costs. A three-phase rectifier requires a more expensive transformer and complicates the contactor arrangement. With large motors, however, a three-phase rectifier may be cheaper than a single-phase one for given d.c. braking voltage and current. For most applications single-phase rectifiers are entirely suitable.

The d.c. may be connected to the motor in a number of ways,[4] but generally the (Fig. 2) connections (a) and (b) are the most useful; they provide very satisfactory braking and tend to simplify switching.

It has been shown[3, 5, 7] that the effect of the d.c. (Fig. 3) is to increase the braking torque as the motor speed decreases,



because of reducing rotor reaction, until the maximum is reached at a low speed. The value of maximum torque is dependent on, and is almost proportional to, the d.c. excitation; also change of rotor resistance alters the shape of the speed/braking torque curve, the speed at which maximum braking torque occurs increasing with the rotor resistance. The point of maximum torque can therefore be adjusted by altering a resistance in series with the rotor in wound-rotor machines.

Curve A (Fig. 3) is the normal shape of the speed/braking torque characteristic to be expected with squirrel cage rotors; as the motor speed falls, braking torque increases to the maximum at a low speed and then falls away sharply. It is important to note here that, although braking torque is zero at standstill because voltage is not then induced in the rotor, there is still a magnetic force tending to lock the rotor, as can be readily appreciated by attempting to turn the rotor by hand with the d.c. still connected.

From the point of view of rectifier design an important consideration is the residual voltage at the motor terminals after the a.c. is cut off. Tests have shown that with squirrel cage rotors this voltage dies away (Fig. 4) to an insignificant value in approximately $\frac{3}{4}$ second. The exact value of the residual voltage applied to the d.c. terminals

Table I.—APPROXIMATE FULL LOAD CURRENT OF THREE-PHASE INDUCTION MOTORS OF ANY MAKE AND AVERAGE EFFICIENCY

H.P.	Full Load Stator Current in Amperes				
	200 V	220 V	230 V	400 V	440 V
½	2	1·8	1·75	1·0	0·9
1	4	3·6	3·5	2·0	1·8
2	7	6·5	6·1	3·5	3·2
3	10	9·1	8·7	5·0	4·6
4	13·5	12·3	11·7	6·7	6·1
5	16	14·5	14	8	7·3
7½	23	21	20	11·5	10·5
10	30	27	26	15	13·6
12½	36	33	31	18	16·4
15	44	40	38	22	20
20	57	52	50	28	26
25	70	64	61	35	32
30	84	76	73	42	38
35	97	88	85	48	44
40	110	100	96	55	50
45	123	112	107	62	56
50	136	124	118	68	62
60	162	147	141	81	74
70	189	172	164	95	86
80	216	196	188	108	98
90	243	221	212	122	110
100	266	242	231	133	121

Table II.—TYPICAL RATING OF W-TYPE SELENIUM RECTIFIER PLATES

Rectifier Plate Code			18	25	35	45	67	84	112	125	17
Maximum continuous d.c. output at max. input of 18 V r.m.s. per line	Single-phase	V	13·5	13·5	13·5	13·5	13·5	13·5	13·5	13·5	13·5
	Bridge ..	A	·075	·15	·3	·6	1·2	2·5	4	6	10
	3-phase ..	V	20	20	20	20	20	20	20	20	20
	Bridge ..	A	·11	·22	·45	·9	1·8	3·6	6	9	15
Typical outputs on intermittent load, input 18 V r.m.s. per line	Single-phase	V	8	8	8	8	8	8	8	8	8
	Bridge .	A	·75	1·5	3	6	12	25	40	60	100
	3-phase ..	V	12	12	12	12	12	12	12	12	12
	Bridge ..	A	1·1	2·2	4·5	9 •	18	36	60	90	150

of the rectifier will depend upon the speed with which the contactors break the a.c. circuit and make the d.c. circuit. The contactor speed will normally be very fast as braking is often required as soon as possible after the disconnection of the a.c.; therefore almost the full line voltage can be considered to be applied to the rectifier terminals. Further tests have shown that if the rectifier is switched into circuit when there is still a residual stator voltage, this voltage will disappear practically instantaneously. The rectifiers therefore have only to withstand an intial surge of very short duration.

There are a number of methods of determining fairly accurately the value of d.c. required to brake a given motor and load in a given time[1, 5, 7]. If such a solution is required, one of these methods may be used when complete details of the motor and load are available. In many cases, however, the exact time of stopping is not of vital importance, the need being rather that the motor should be stopped as smoothly and quickly as practicable. Considering the problem on this basis and from a knowledge of the horse power of the motor, one can obtain an average figure for normal full load stator current (Table I) and then say, for loads of the first kind, that d.c. of the order of 1–2 times the normal full load stator current will be found suitable; for loads of the second kind 2–2½ times and for loads of the third kind 3–4 times will be adequate.

The average stopping time of a range of unloaded four-pole squirrel cage motors may be plotted against d.c. amperes expressed as a percentage of full load stator current (Fig. 5). This curve may then be used to arrive at an approximate idea of stopping time for any four-pole motor, but it will be appreciated that the stopping time of individual motors, particularly fractional h.p. motors, will depart from this mean curve. When more accurate stopping times are required, similar curves could be plotted for the actual motors in use. The current chosen and the duration of the braking cycle must, of course, be considered in relation to the permissible temperature rise of the motor.

Having decided upon the d.c. to be injected, the stator resistance of the motor must be known in order to arrive at the output voltage required from the rectifier.

Rectifier plates are available in a range of sizes (Table II) and a single-phase bridge

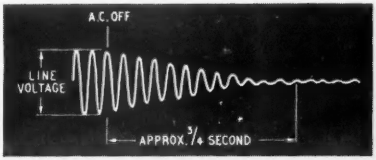
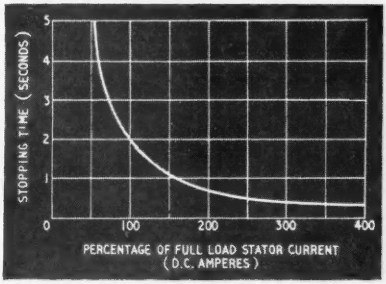


Fig. 4.—Wave-form of residual stator voltage of a squirrel cage induction motor running down freely. (Not to scale)

Fig. 5.—Stopping time of 4-pole squirrel cage motors



circuit is the most useful, but a three-phase bridge may be advantageous for large motors. The number of series plates per arm of the rectifier is governed, first, by the number necessary to give the output voltage required and, secondly, by the number required to absorb the surge caused by residual stator voltage. In many cases the number of plates necessary to give the required d.c. output will be enough to take care of the switching surge, but in any case the number in series should not be fewer than four per arm for 440 V motors, or two for 220 V motors.

The values of mean d.c. per plate (upper half of Table II) are permissible continuous loadings. All injection braking rectifiers will be intermittently rated. Ten times normal full load mean current will be a good working point and figures at this rating are therefore included in the table. If the loading cycle is repeated with only short periods of rest, ten times normal current will overheat the rectifier. The mean current corresponding to the intermittent load current must then be determined by the formula below and the rectifiers chosen accordingly: Let I_0 be the intermittent load current, A the intermittent load period and P the off-load period, then the mean current equivalent to continuous loading:

$$I_m = I_0 \sqrt{\frac{A}{A + P}}$$

The author thanks his colleagues for their constructive criticism and acknowledges the valuable help of M.T.E. Control Gear, Ltd., in providing testing facilities. He is indebted to Standard Telephones and Cables, Ltd., for permission to publish the results of this investigation.

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New Books

Electrical Installation Work. By T. G. Francis, B.Sc., M.I.E.E., M.I.Mech.E. Pp. 232; figs. 237; index. Longmans, Green & Co., Ltd., 6 & 7, Clifford Street, London, W.1. Price 12s 6d.

This is a text-book for the technical college student studying for the City and Guilds examination rather than a serious work on the business of wiring buildings. A number of chapters are devoted to rather general descriptions of measuring instruments, illumination, electric heating, primary and secondary cells and telephones which should be instructive to the young student. The chapters dealing with what is generally known as "installation work," i.e., supply systems, consumers' circuits, cables and wiring systems are somewhat academic and appear to lack practical experience in present-day practice and trends.

Much space is devoted to soldered cable joints, to lead-covered wiring and to traditional diagrams of one- and two-way lighting switching, but there is scant reference to t.r.s., to "Pyrotenax," or to fused plugs and ring circuits. Similarly, although single-pole fusing is mentioned all the diagrams show the old two-pole fusing. The chapters dealing with earthing and testing are good and should teach the student sound principles.

The author has been unfortunate in that a twelfth edition of the I.E.E. Wiring Rules was published at the same time as his book and his references to the eleventh edition are therefore out of date.—F. J.

Books Received

Electromagnetic Fields: Theory and Application. By Ernst Weber. Vol. I—Mapping of Fields. Pp. 590; figs. and index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 80s in U.K.

Electrical Communication. By A. L. Albert. Third edition. Pp. 593; figs. and index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 52s in U.K.

Industry and the House

The Fuel and Steel Debates

By F. J. ERROLL, M.A., A.M.I.E.E., M.P.

WHEN M.P.s returned to Westminster after the long Christmas vacation they were surprised to learn from those representing industrial constituencies or having industrial connections that few defence orders had apparently so far been placed. It is understandable that the Government should not wish to broadcast the placing of such orders, but the existence of defence orders with all the sub-contracting that they necessitate would be bound to become general knowledge in a short space of time.

It is too soon to draw a definite deduction, but from the form of Parliamentary debates since the House resumed it seems clear that the Government has been preoccupied with many other matters as important, to them, as the defence programme. The Opposition has been quick to stage debates which would serve to show up what they consider to be weaknesses in the Government's handling of affairs.

Coal Shortage

After a quiet opening week the second week saw a full-dress debate on the coal situation. The Government explained what it was doing to minimize the effects of the present shortage, from appealing to the housewife to cutting out less essential train services. The theme of the Opposition was that the Government should have foreseen the shortage which was obvious months ago, and that it was in any case a sorry advertisement for nationalization. Nevertheless the Government won the day by the margin of eleven votes.

During the following week the Opposition staged debates on the meat situation, which has most serious political implications for the Government, and the vesting of the steel industry. Both were critical debates, but the Government secured narrow majorities in both cases.

In the course of the steel debate much familiar ground was traversed. The Opposition, led by Mr. Churchill, claimed that nationalization of this industry, always unnecessary, was now a direct threat to the success of the rearmament programme. The heads of the industry, who should be concentrating on increasing output, would have their attention diverted by the irrelevant claims of the new Iron and Steel Corporation. The Opposition claimed that the Government's determination to proceed immediately with the vesting of the industry on 15th February instead of making use of the powers of postponement which they had themselves written into the Act was simply a means of securing the acquiescence of their own left-wing in defence matters.

Government's Case

The Minister of Supply, Mr. Strauss, was the principal Government spokesman. He said that it was necessary to remove the uncertainty now surrounding the industry by executing the nationalization plan passed by a previous Parliament and endorsed twice by the present one. His junior colleague, Mr. John Freeman, wound up in an excellent speech which nevertheless failed to add any further knowledge to the reasons the Government has for vesting the industry now.

The Minister of Supply is a particularly busy man just now. Apart from this debate, he has of course the responsibility for the vesting to shoulder, and the main burden of raw material shortages falls upon him. The previous week he had to answer no fewer than forty-two questions on non-ferrous raw materials and allied subjects. He is also responsible for the nation's atomic energy programme. And, when he has time, he must place orders for the rearmament programme.

An undesirable practice has been growing up in recent legislation of presuming all the directors and officers of a company to be guilty of an offence unless they can prove separately their respective innocence.

Protests have been made by the Opposition, but hitherto these have been unavailing. Now the same type of clause is finding its way into private legislation promoted by municipal corporations and county councils. The Institute of Directors has petitioned strongly against such clauses and achieved its first success last week when the promoters of the Worcester Corporation Bill agreed to withdraw the offending clause unreservedly. This is a successful beginning to a long campaign designed to restore to company directors the same position in the eyes of the law which is at present enjoyed by all other British citizens. The Rivers (Prevention of Pollution) Bill and the Sea Fish Industry Bill at present going through the House contain similar offending clauses and these will be strenuously resisted by the Opposition.

PARLIAMENTARY NEWS

From Our Special Reporter

IN the House of Lords last week Lord Douglas asked the Government whether its attention had been called to serious nuisance and damage caused by the emission of smoke and grit from Battersea power station, the amount of grit deposited in the immediate vicinity being at times of the order of 400 tons a square mile a day.

Lord MacDonald, Paymaster-General, said that the position was constantly under review, and the chief alkaline inspector of the Ministry of Fuel and Power had visited the station from time to time, and would do so again in the very near future.

Lord Douglas said that when the station was originally proposed the local authorities were given an undertaking by the London Power Company that the best practical means of abating smoke and grit would be adopted. Surely that undertaking should be observed now the station was under public ownership.

Effects of Power Cuts

Lord Balfour of Inchrye, calling attention to the engineering industry and the rearmament programme, said that very serious damage was being done to industry to-day by the lack of industrial power. A steel firm in Sheffield suffered 44 individual cuts, resulting in a loss of 43 hours of mill work, and a shortage of fuel resulted in another 15 hours' stoppage. A firm on Tyneside reported a loss in production and money totalling 21,178 man-hours, costing over £4,000 in wages and a very large loss to the management. Yet there had been an extension of hire-purchase for electrical appliances, advertisements advocating the greater use of electricity for domestic purposes, and a retention of the two-part tariff which encouraged the domestic consumers to use a certain minimum amount of electricity if they were to get back the charges they had paid to the electricity authority. The exporting of generating plant in order to get dollars was an admirable policy taken up to a certain point, but taken beyond that it was a false economy.

Lord Wolverton remarked that before the war we finished a power station in three years; to-day it was taking about five years. One saw from the figures provided by the Central Electricity Board that it was intended in the years 1944 to 1947 inclusive to produce an additional 5,440,000 kW. Up to the end of last year plant of only about 3,469,000 kW had been actually brought into commission; therefore the industry was about 1,971,000 kW behind its programme. One reason was the lack of boiler equipment. He understood that the British Electricity Authority had scoured Europe and had succeeded in getting a certain number of valves from Italy, but was not successful in persuading the Treasury to let it have two boilers for a new station in the Midlands. The Treasury said it could not spare the dollars.

Viscount Alexander of Hillsborough, replying for the Government, said it would be more convenient if the condition of the electrical industry were discussed in a debate on the general work of the Ministry of Fuel and Power. However, if 1939 and 1949 were compared it would be found that the sale of electricity had doubled in the ten years. Regard must also be had to the fact that during the war we had perforce to abandon much of what normally would have been earmarked for capital investment in the electrical industry.

Lord Cherwell asked if Viscount Alexander would explain why, in those circumstances, the nationalized electricity industry endeavoured to persuade domestic consumers to go in for electric heating appliances.

Viscount Alexander said that point had better be brought to the attention of the Ministry of Fuel and Power. He knew that the sale of some electrical appliances by the Boards had been given up. They were not selling fires. In the case of advertising, there was no longer what he might call "promotional advertising" by the Boards.

In reply to what Lord Wolverton had said, in 1945 the new plant installed was equal to 183 MW; in 1946 it was 307; in 1947, 340; in 1948, 566; in 1949, 703; and in 1950, 965. They could not go very much more quickly in the direction of getting capital and machine plant without having a building plan to go with them. The whole of this improvement would depend largely on the extent to which they could cut into another part of the capital investment programme.

Lord Wolverton said that the serious thing was that the gap was getting wider instead of narrower. In many cases the buildings were ready but the plant, especially the boiler plant, was not there.

Viscount Alexander said that the firms who were producing capital equipment still had considerable difficulties, not the least as regarded boiler tubes and valves. He was told that in 1949 steps were taken to ensure a better supply of tubes to firms holding boiler contracts with the Electricity Authority, but that there were one or two bottlenecks which had to be surmounted. The import of tubes from Germany was arranged and these had improved the position, and a great deal of the trouble was now passing. With regard to valves, two of the principal producers for the Electricity Authority—Glenfield & Kennedy and Dewrance & Company—had increased their productive capacity. The first had rebuilt their works and increased their capacity by 30 per cent since 1938. The other firm was adding to its present accommodation a Government factory at Hillingdon and its capacity would be increased by 25 per cent to 30 per cent. He was happy to say that they were well on the way to a solution of the difficulty of valves.

Hopes had been expressed that the Government would not continue to export generating plant while it was needed to recover complete balance between demand and supply at home. At the beginning of the period of six years which he had taken, contracts were made, largely within the Commonwealth, on a basis with which it would be exceedingly difficult to interfere, and which, in some cases, were in connection with the overseas development which it was desired to have continue quite uninterruptedly, in the general interest both of their economy and their defence and rearmament programmes. He gave an assurance that, over the long-term programme, all that could possibly be done in capital investment to speed up this matter would be done, within the limits of what we could afford as a nation.

Co-ordination of Publicity

Last week in the House of Commons the Minister of Fuel and Power (Mr. Noel-Baker) told Mr. Boyd-Carpenter that he had set up a committee consisting of representatives of the electricity and gas industries, the National Coal Board and the Coal Utilization Joint Council, with the Parliamentary Secretary to the Ministry in the chair. He had asked the committee to ensure that all the publicity work of the three industries was co-ordinated with the efforts of his Department to secure economy in the use of fuel and power.

B.E.A. and Hire-Purchase

Mr. Marlowe asked the Minister of Fuel and Power if he would make a statement as to why he has not given any statutory directions to the British Electricity Authority to ensure its observance of the Government's policy to discourage the use of funds for the financing of hire-purchase agreements.

Mr. Philip Noel-Baker:—"The policy of H.M. Government is to restrict the borrowing of money for the extension of facilities for hire-purchase. The Electricity Boards borrow no money for this purpose; they finance their hire-purchase sales from trading surpluses. The value of the sales by the Boards of appliances on hire-purchase terms is, at to-day's prices, well below the level of sales by the electricity supply industry before the war; and if the appliances on hire are included, the amount is less than one-third. Nevertheless, I am considering whether any restrictions are required."

Ban on Shop Lighting

An attempt to annul the Advertisement Lighting (Prohibition) Order, 1951, was made in the House of Commons last week by a group of Conservative members.

Col. Crosthwaite-Eyre, moving the annulment of the Order, said that the statement of the Minister of Fuel and Power that there would be a saving of 50,000 tons of coal in three months by the prohibition of shop lighting and advertisement lighting was an *ex parte* statement which was completely fallacious. Things were gloomy enough without the Government adding to them by imposing this black-out.

Mr. Robens, Parliamentary Secretary, Ministry of Fuel and Power, resisting the annulment of the Order, said that they had to make certain that the stocks of coal at power stations were as high as possible so that, should bad weather come, wholesale cuts, which would be disastrous to industry, need not be made. Measures taken in the past few weeks had achieved the result intended—stocks were now slightly higher. The amount of coal saved by the Order was small compared with total consumption, but every sort of saving was important.

The motion was negatived.

Central African Markets

Prospects in the Rhodesias and Nyasaland

OPPORTUNITIES for increased trade with the three British Central African territories of Southern and Northern Rhodesia and Nyasaland are reviewed by Mr. D. Broad, U.K. Trade Commissioner, Southern Rhodesia, in an Overseas Economic Survey published by H.M. Stationery Office, price 2s 6d net.

As a measure of the development that has taken place in Southern Rhodesia, it is shown that whereas in 1939 imports, exclusive of specie, stood at £8·9 million, in 1949 the figure was over six times as high—£54·6 million. Of this amount the United Kingdom's share was £28·2 million, followed by South Africa with £12·2 million. A word of caution is sounded, however, regarding the false sense of security which British exporters may feel during the present restrictions on imports from dollar countries. During and after the war American and Canadian goods, domestic and industrial, gained a hold on the market, and achieved a high reputation by their attractive design and presentation, together with convenience and suitability to local conditions. There is the greatest possible need for exporting the best at the most reasonable price.

Dealing with representation, comment is made on reported cases of British manufacturers terminating agencies because of the present freedom from dollar competition. This has given rise to a good deal of resentment among the agents, who have complained that, having paved the way for business, they should be allowed to enjoy the results of their efforts. Such action by manufacturers, it is considered, might be detrimental to them when the free market is resumed.

In Northern Rhodesia conditions are somewhat different, but the prosperity of the copper belt, reflected in the country's economy, and the development of secondary industries are expected to result in a growing demand for both capital and consumer goods. In 1939 imports totalled £4·6 million and in 1949 £21·3 million, these figures being considerably exceeded by the value of the country's exports.

Nyasaland is the smallest and least developed of the three territories, though its population (2¼ million) is the largest. There are only about 3,000 Europeans compared with 116,000 in Southern Rhodesia. At the same time, the rising standard of living of the native population is resulting in an expanding trade and in 1949 imports totalled £4·3 million against £0·8 million in 1939, the U.K. being the principal supplier.

Of several important projects which have recently been under consideration the most noteworthy is the Kariba Gorge hydro-electric scheme on the Zambesi River 350 miles north-east of the Victoria Falls. This has been under investigation by the Southern Rhodesian Government for some years, and Northern Rhodesia is also interested in the scheme, which would be capable of a very large output—the report mentions a million kW. In Northern Rhodesia a development at Kafue, also on the Zambesi, has been discussed, but Kariba may render this unnecessary.

Industry in Nyasaland is mainly concerned with the production of tung and tung oil, with fishing and associated activities in the lake area, but plans include wider provision of electric power.

E.D.A. Public Speaking Competitions

TWELVE women and six men were candidates recently in the E.D.A. Public Speaking Competitions held at the Yorkshire Electricity Board's Leeds offices. All of them were drawn from the Y.E.B. Sub-Areas, except two men from the North Eastern Board. The men's competition, held jointly with the North Eastern Board, took place on 24th January and was presided over by Mr. F. Newey (deputy chairman, Yorkshire Board). The judges were Ald. J. H. Bingham, J.P. (member Y.E.B.), Mr. C. R. Taylor (commercial officer, N.E. Board, Harrogate Sub-Area), Mr. D. Bellamy (manager, Y.E.B., Hull Sub-Area) and Mr. R. A. H. Sutcliffe (education and training officer, Y.E.B.). The first prize was won by Mr. K. Prescott (statistical assistant, Y.E.B., Grimsby Sub-Area) and the second prize by Mr. W. Allen (assistant commercial engineer, N.E. Board, Wear Sub-Area, Boldon District).

The women's competition was held on 26th January. Mr. A. Haselhurst (chief commercial officer, Y.E.B.) presided, and the judges were Ald. Mrs. J. Chambers, J.P. (chairman, Bradford Education Committee), Ald. J. H. Bingham (member, Y.E.B.), Mr. J. A. Stedman (representing E.D.A.) and Mr. R. A. H. Sutcliffe (education and training officer, Y.E.B.). Miss Barbara Hanforth (demonstrator, Leeds Sub-Area, Y.E.B.) won the first prize and Miss Margaret O. Morris (housecraft adviser, Sheffield Sub-Area, Y.E.B.) the second. Ald. Mrs. Chambers presented the prizes.

Cost of Cleaner Air

Sulphur Emission from Coal Combustion

By A. GRAHAM THOMSON

BRITISH coals have sulphur contents ranging from 0·5 to 4 per cent. Coke usually contains about the same proportion of sulphur as the coal from which it is made. When the coal or coke is burnt most of the sulphur is converted into sulphur dioxide gas and passes up the chimney with the smoke. In 1948 about 190 million tons of coal was burnt in Britain, resulting in the emission of 5·3 million tons of sulphur dioxide.

Besides being detrimental to health, sulphur dioxide is one of the main causes of the corrosion of metals. It may also damage paint, can hasten the decay of stone and building materials and, in high concentrations, is harmful to plants and animals. The total cost to Britain of atmospheric pollution by sulphur dioxide from coal combustion has been estimated by the Department of Scientific and Industrial Research at £20 million a year, equivalent roughly to 2s on the cost of each ton of coal consumed.

Sulphur Removal Costs

Efficient methods of smoke prevention have been developed and should gradually result in a progressive reduction of the nuisance from this source. The problem of sulphur dioxide presents greater difficulties. The volume of flue gas discharged every hour from a large boiler installation using some 2,000 tons of coal daily is about 30 million cu ft. It is technically possible to remove the sulphur dioxide from the flue gas before it passes into the stack, but the incorporation of suitable processes in large boiler installations in the United Kingdom would add substantially to the cost of coal and increase the price of electricity.

The Director of Fuel Research, Dr. A. Parker, in a paper presented recently at the Royal Society of Arts in London, stated that the cost of washing flue gases with river water at the Battersea power station was equivalent to adding about 7s to the cost of every ton of coal burned. For the Howden-I.C.I. scrubbing process at the Fulham power station the overall cost was equivalent to an additional 10s a ton. Dr. Parker considered it probable that the net cost at Fulham, after allowing for the value of the by-products, would be of the order of an equivalent addition of 9s a ton to the cost of the coal burned. To what extent are the advocates of cleaner air willing to shoulder these extra costs ?

Local Concentrations

The background to this aspect of the atmospheric pollution problem is the rapid increase in the use of electricity. This has resulted in the establishment of new power stations and the expansion of existing stations. In 1949–50, electricity generating plants consumed 29·24 million tons of coal and produced 900,000 tons of sulphur dioxide, equivalent to only about 17 per cent of the total pollution from this source. Attention has become focused on power stations, however, because a large quantity of coal burnt at one spot necessarily tends to produce a high local concentration of sulphur dioxide.

For this reason some local authorities oppose the establishment of power stations in their areas unless provision is made for washing the flue gases to remove the sulphur dioxide produced. The British Electricity Authority is understandably reluctant to adopt measures which would add considerably to production costs, particularly having regard to the relatively small proportion of the total sulphur dioxide emission for which power stations are responsible. Since the subject is highly controversial, there is an urgent need for basic scientific data to determine the exact position. Of major importance to the nation, therefore, is a comprehensive investigation into all aspects of the sulphur dioxide problem, which is being undertaken by the Fuel Research Station of the D.S.I.R.

If measures to prevent pollution are to be embarked upon, the first need, clearly, is for some reliable means of assessing the success achieved. Regular observations of

atmospheric pollution have been made in Britain for many years. In 1927 the responsibility for this work was taken over by the D.S.I.R. Most of the research involved is carried out by the Fuel Research Station, which has developed and standardized methods of measurement.

Under its ægis local authorities are making regular observations of atmospheric pollution from smoke, grit and sulphur dioxide. There are now some 700 instruments in use throughout the United Kingdom and the number is gradually increasing. Observations are made in all the principal industrial areas in England, the figures obtained being sent to the research station for analysis and publication.

The station maintains certain observation posts itself as part of its general scheme for measuring pollution. In addition, it is carrying out surveys of the distribution of sulphur dioxide in five areas in connection with the chimney emissions from electricity generating stations. The object of these surveys is to gauge the effect of the generating stations on the level of pollution in these areas and also the effect of certain changes in the outputs of the stations.

Battersea and Fulham Stations

In the South-West London area some 30 instruments are being used for measuring the concentration of sulphur dioxide, the importance attached to this area being due to the presence of the Battersea and Fulham power stations. Before the war sulphur dioxide was removed from the flue gases at these stations by washing and scrubbing processes, respectively, but during the war gas cleansing was stopped for security reasons. Now the Battersea plant is gradually being brought back into commission. The gas from the north-western and north-eastern stacks is again being washed and emerges from the stack as a white plume which is in marked contrast to the grey smoke emitted from the other stacks. This particular survey was started in 1945, which was a considerable time before flue gas washing at Battersea was recommenced. It is hoped that the instruments will indicate the effects of cleaning the gases on the degree of pollution in the area, to show whether these extremely expensive processes are worth while.

Quite apart from the additional cost of the coal treated, doubts have been expressed about whether this is the best means of tackling the problem. Possibly it might be preferable to achieve a better dispersion of gases by increasing the height of the stack. Another point to be considered is that washing lowers the temperature of the flue gases leaving the stack. It may be, therefore, that the gases are not so readily dispersed and diluted in the atmosphere well above ground level, and that under certain meteorological conditions there may be a greater tendency for them to descend.

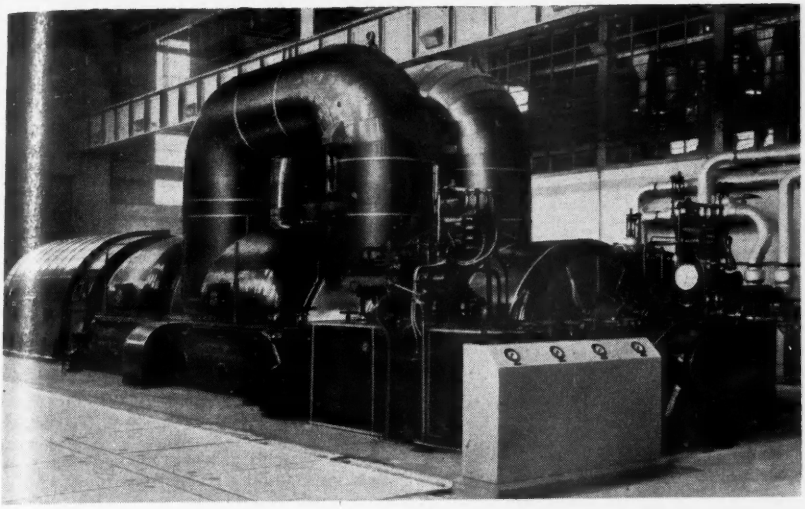
Other surveys of the distribution of sulphur dioxide are in progress in the East London, Kingston and Croydon areas; also at Staythorpe, Notts. All these investigations are designed to reveal the effect on the degree of pollution of new generating stations or of major extensions to existing stations. It is hoped that Staythorpe will provide some valuable information, since in this area a new power station has been built in open country where there is very little pollution from other sources.

In areas where pollution from other sources also exists it is difficult to interpret the results of observations, particularly since the dispersal of sulphur dioxide is influenced by meteorological and seasonal conditions. Under certain conditions there is a greater tendency for the flue gases to descend, while sulphur dioxide increases in winter to as much as, three times its normal summer concentration. The data obtained from instruments must therefore be coupled with meteorological observations, so that the investigations are of a very long-term nature.

Search for Cheaper Methods

People who press for immediate action fail to appreciate the magnitude and complexity of the problem, nor can the economic aspects be overlooked. Efficient processes for removing sulphur dioxide from flue gases can be installed, but at a cost which consumers may not be prepared to shoulder. The Fuel Research Station is endeavouring to develop cheaper processes, but at the moment no inexpensive method is in sight.

It should also be borne in mind that domestic appliances are responsible for approximately the same volume of sulphur dioxide emission as power stations, while there are also the railways and industrial consumers of coal to be considered. Thus the possibility cannot be excluded that the benefits of cleaning flue gases at power stations may be wholly incommensurate with the expense involved. Only the long-term research programme can enable this question to be answered with any degree of certainty.



Manufacturers' Activities—VIII

Large Volume of Metrovick Business

THE aggregate power of new steam turbo-generating sets commissioned for the B.E.A. by the Metropolitan-Vickers Electrical Co., Ltd., was 60 per cent greater last year than in 1949, the year's contribution being some 460 MW of additional capacity. A large proportion of the plant put in hand last year is for new B.E.A. stations or extensions.

Besides the second set started up at Littlebrook, the 75 MVA alternator (which is also hydrogen cooled) of a 60 MW set for Battersea was tested at the makers' works (54 MVA wattless load) and has been erected on site. This machine and a 62·5 MVA generator for Poole are being fitted with gear driven exciters to run at 1,000 r.p.m. Also put into service were the first two of four 52·5 MW sets at Croydon, the fourth and fifth of 45 MW at Ipswich, one of 50 MW at Neepsend (Sheffield), and two of 52·5 MW at Agecroft (Salford). Four of 25 MW at 22 kV were despatched to South Fremantle (Western Australia) and others commissioned in Egypt and Rhodesia.

Export orders, which were again satisfactory, included two further 30 MW back-pressure sets to exhaust into coal drying plant for the Morwell briquetting works in Australia (for which three similar sets are already in hand) and a 7,500 kW set for Clarence River, N.S.W.; two of 15 MW for West Bank No. 2 (East London) station in South Africa; two of 20 MW for Southern Rhodesia, in addition to two of 10 MW; and three of 15 MW for the Nchanga copper mines of the Anglo-American Corporation where (with two similar sets in hand) they will augment existing Metrovick plant and winding engines. The first order from Nova Scotia was for a single-cylinder set of 20 MW at 3,600 r.p.m.

Smaller sets will go to India, Pakistan, Poland, the Canary Islands and Greece; about 25 MW of small turbines geared to

Our title picture shows one of the 45 MW 3,000 r.p.m. turbo-generators at Cliff Quay, Ipswich, for which five similar sets had been completed by the end of 1950

salient pole generators was completed during the year and an even larger total was ordered.

The intercoolers, heat exchangers and 15 MW generator of the B.E.A. gas turbine for the Trafford power station have been delivered. A gas turbine geared to a 2,000 kW generator, for the Ministry of Fuel and Power, will be installed in the Metrovick works at Barton for development testing in continuous operation on producer gas. The producer plant has been designed and developed jointly by Joseph Lucas, Ltd., and the Incandescent Heat Co.

Among vertical-shaft generators ordered for water wheels are two of 82·5 MVA at 214 r.p.m. which are of record size for British manufacturers; they will go to Saltos del Sil, Spain, with associated transformers and switchgear. Two of the three 32 MVA horizontal-shaft generators for Cavado, Portugal, have been completed as part of an extensive contract being executed jointly with the English Electric Co., Ltd.

Three synchronous condensers of 30 MVA at 1,000 r.p.m. were despatched to Spain while thirteen others aggregating over 300,000 kVA are now in course of manufacture, including one of 40 MVA for Australia.

Last year was a record one in respect of orders received for transformers as well as for those made and shipped. Some of the latter went to Portuguese hydro-electric stations, to South America, South Africa, India and Australia. Apart from B.E.A. and Electricity Board requirements, orders came from central India, New Zealand, South America, Tasmania and Madras, while ninety-one 225 kVA reactors were ordered for Sydney, N.S.W., and a 750 kV testing transformer is to be made for Micanite & Insulators, Ltd.

Among instrument transformers, voltage and current types have been made for 110, 132 and 165 kV; forty-two 132 kV wound primary current transformers were ordered for the Carrington power station and twenty-two 132 kV voltage transformers for use indoors at the Uskmouth station, for which service so high a voltage is unusual. There have been inquiries for both current and capacitor type voltage transformers for 345 kV, of separately mounted designs.

Outstanding installations of outdoor switchgear were commissioned at the Cliff Quay (Ipswich) power station and in Finland, Portugal and central India. Indoor gear was erected at Fremantle and in B.E.A. substations at home while power station switchboards are being erected at Bankside (London) and Agecroft (Salford) and made for Deptford (East) and Plymouth. Smaller metalclad gear was supplied to collieries, an oil refinery and to cotton mills in Egypt.

Instruments, meters, protective gear and automatic voltage regulators are in steady demand. Three of last year's developments, the MC process or exposure timing relay, the MH2 integrating clock and the Q pressure switch, are now in production.

Large a.c. motors were ordered to a total of 120,000 h.p.; also d.c. motors for rolling mills and mine winders with corresponding generators for m.g. sets. Medium and small motors were supplied in quantity and starters in variety; oil break contactor starters for medium voltage are a new Metrovick departure.

The increasing demand for automatic arc welders continued; resistance welders of many special designs were made and some very large ones are in hand for a motor car manufacturer. There has

One of two 80 ton diesel-electric locomotives with Metrovick electrical equipment for mixed traffic on the Irish State Railways

been an expanding market for welding transformers and reactors.

Two generators of from 60 to 650 kVA at from 1,500 to 10,000 c/s have been supplied for induction furnace installations; four motor-generator sets have been ordered, one of which, having two 556 kVA 1,500 c/s generators, will go to Altdorf in Switzerland. A number of vacuum induction furnaces have been supplied and others are on order. A 35 kV furnace (20 lb) for steel melting was put into service, which can also furnish a r.f. output for heat treatment or brazing; it is fully shielded and a filter prevents r.f. feedback into the mains. Several 5 and 10 kW r.f. generators have been installed.

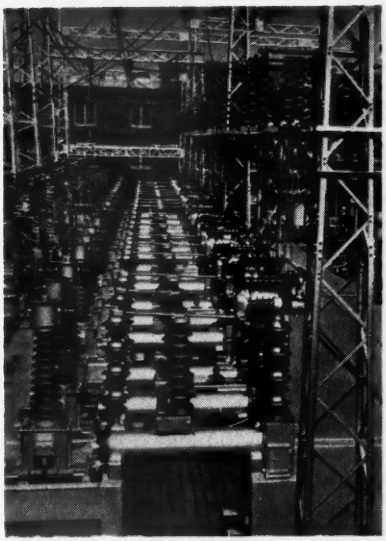
Special machines have also been made which produce heat in a similar way to resistance welders; one of them is for brazing coil ends to commutator headers while another is of 250 kVA for heating steel sections up to 1,000 deg C on a cycle of twelve operations per hour. An air heater rated at 1,500 kW is to be built for the National Gas Turbine Establishment with automatic control of the outlet temperature. Tubular sheathed elements for industrial heating have been in increasing demand and orders have been received from Australia and elsewhere for "Redring" domestic boiling plates.

Extremely diverse equipments for the main drives of rolling mills were despatched during the year, the total r.m.s. output being some 48,000 h.p. Eleven of the largest now in course of manufacture include d.c. mill motors aggregating 27,000 h.p.; nine of them will have Ward-Leonard sets while four will be energized by grid-controlled rectifiers. Equipments for six blast-furnace charging hoists were completed and another is under construction.

Electrical gear, with mechanical parts in many cases, was supplied for 36 mine winders totalling 55,800 h.p. (r.m.s.) during the year; overseas destinations included South Africa, Rhodesia, Turkey, Spain and Portugal, while orders came in for 33 winder equipments of from 90 to 4,700 h.p.

Large orders for flameproof switchgear and distribution boards as well as motors were placed by oil and petroleum refineries at home and abroad.

The latest of several important railway orders is for 48 eight-axle 1,100 h.p. diesel-electric locomotives for the Western Australian Government; they are for general service, will have Crossley engines and are believed to represent the largest order of the kind ever placed with a British manufacturer. New South Wales has ordered 40 six-axle 3,780 h.p. electric locomotives for the 1,500 V Sydney–Lithgow line; they will have regenerative braking for passenger and coal traffic. Brazil is to have ten more four-axle 1,070 h.p. locomotives for the 3,000 V Parana–Santa Catarina system. Most of the 107 locomotives ordered during the year will be of M.V.-Beyer, Peacock construction.



Part of a 100 kV air-blast circuit breaker installation in Finland

The South African Railways ordered fifty-two 3,000 V motor coach equipments. More than 100 trolley-bus equipments were commissioned at home and abroad while further orders for trolley-bus motors and motor-generators came from London Transport. Substantial numbers of tramcar equipments were "in work": 100 sets for Glasgow, 35 each for Sheffield and Rotherham and six for Hong Kong.

Two 8,000 s.h.p. geared steam turbines for ship propulsion were ordered, while marine auxiliary generators, motor and control gear continue to be in demand. The first of a large batch of small geared turbo-generators for the Admiralty has been completed.

Canadian Hydro-Electric Development

Progress during 1950

A NEW record in water-power development was established in Canada during 1950. The review by the Department of Resources and Development shows that an additional 1,037,275 h.p. of plant was installed during the year, bringing the installed capacity of water-power plants in Canada to 12,654,835 h.p. or 23 per cent of total resources. The major new prospects were in the heavily-industrialized provinces of Ontario and Quebec.

New plants and extensions now under construction will eventually produce an additional 1,000,000 h.p. Those under preliminary construction or definitely planned will produce another 1,500,000 h.p. The completion of projects was spurred by the steadily increasing demand for primary power. The demand increased by about 8 per cent in 1950. The review gives details of schemes completed or planned in different provinces.

In Ontario work was practically completed on a plant at Des Joachims on the Ottawa River, about forty miles north of Pembroke. That plant will have a capacity of 480,000 h.p. Work was well advanced on another Ottawa River development at Limerick Island which will have a capacity of 160,000 h.p. Work also proceeded on a third site on the Ottawa River, La Cave Rapids. This involves the construction of thirty-seven miles of new railway to replace the existing section of the Canadian Pacific Railway from La Cave to Temiskaming which will be flooded when the head water is raised to operating level. The plant will have an initial capacity of 192,000 h.p. Following ratification by Canada and the United States of the Niagara diversion treaty, the Ontario Hydro-Commission planned a new development on the Niagara River. The new plant will have a total capacity of 600,000 h.p. and will begin operations about 1954. To supplement its hydro-electric power capacity, the Ontario Commission undertook the construction of major fuel-power plants in Windsor and Toronto.

In Quebec, new developments produced an additional 241,800 h.p. Work was going ahead on projects that would supply another 500,000 h.p. in 1951. Among the larger projects was a Shawinigan Water and Power Company development at La Trenche Rapids on the St. Maurice River. The plant will have an ultimate capacity of 390,000 h.p. The Quebec Hydro-Electric Commission added another 110,000 h.p. to the capacity of its plant at Beauharnois on the outskirts of Montreal. The Aluminum Co. of Canada started work on large projects in the Saguenay area. Various other private and public corporations undertook developments in north and north-eastern Quebec, in the eastern townships, and in the Lower St. Lawrence River area.

In British Columbia, the B.C. Power Commission and the B.C. Electric Co. increased output. The Aluminum Co. of Canada continued investigations of a project on the Nechako-Nanimka rivers which may eventually produce 1,600,000 h.p. In Alberta, additions were made to water-power and steam-plant developments. In Saskatchewan fuel-power plants were extended. Manitoba also reported some expansions, although work was delayed by spring flood conditions. During the year, 4,400 farms were connected to Manitoba Power Commission lines, bringing the total to 21,400 farms now being given service. Among new projects completed in Nova Scotia were a 12,800 h.p. plant at Deep Brook and a 5,000 h.p. plant at Paradise Brook. New Brunswick Electric Power Commission undertook development of 27,000 h.p. on the Tobique River. The Newfoundland Light and Power Co., serving principally St. John's and Bell Island, practically completed a new development of 13,000 h.p. on the Mobile River. Work was started on the extension of a small fuel-power plant in Charlottetown, Prince Edward Island.

Cartridge Fuse-Links

IN the recently published British Standard for cartridge fuse-links for use in railway signalling circuits (B.S. 714: 1950) the information contained in the original 1936 issue has been revised to bring the range of fuses concerned into line with modern developments in design and manufacture. In other British Standards, current ratings have been assigned only to fuses and not to cartridge fuse-links. This publication has been drawn up to apply to cartridge fuse-links only, and covers fuse-links suitable for use in railway signalling circuits in which the declared voltage does not exceed 250 V. It lays down standard current ratings and standard dimensions; it deals with manufacturing requirements, end-caps, marking, performance and the type tests required.

Copies are obtainable from the Institution, 24, Victoria Street, London, S.W.1, price 2s.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Radio Rentals, Ltd.—The annual meeting was held on 5th February, Mr. H. F. Hunt (chairman) presiding. In his statement circulated with the report and accounts, the chairman said that during the past financial year they had achieved a higher turnover in radio renting than ever before. They also rented a large number of television receivers. The number of branches had been increased by 10 per cent with several new branches in areas where their service was not previously available. Mains Radio Gramophones, Ltd., provided the parent company with radio sets at satisfactory prices and was now also making television sets.

Birkbys, Ltd.—At an extraordinary meeting held on 29th January, resolutions were passed changing the status of the company from a private to a public limited company. The full control of the new public company remains vested in the original directors and staff, and the entire issue of ordinary shares is still held by the directors.

J. & E. Hall, Ltd., report a trading profit of £631,274 for the year ended 30th September, compared with £559,028 for the previous twelve months. The net profit was £165,054 (£113,831). A final dividend of 10 per cent (7½ per cent) brings the total distribution for the year to 12½ per cent (10 per cent). The carry forward is £161,687 (£284,893).

Pye, Ltd.—The subscription list for the issue of 750,000 5 per cent cumulative preference shares of £1 at 20s 9d per share, was closed at 10.5 a.m. on 8th February, the issue having been applied for over five times.

Electrical Components, Ltd., are maintaining their interim dividend at 7½ per cent.

The Oriental Telephone & Electric Co., Ltd., has declared an interim dividend of 4 per cent (unchanged).

New Companies

B.M.W. (Sandown, I.W.), Ltd.—Registered 1st February. Capital £2,000. Electrical engineers and general electrical installation contractors, etc. Directors: S. A. F. Morley, J. C. A. Wilson and S. B. Bones. Regd. office: 48, High Street, Sandown, I.W.

Wilson Electric (Battersea), Ltd.—Registered 5th February. Capital £1,000. Manufacturers and merchants of and dealers in electric motors, dynamos, etc. Directors: C. F. Wilson and W. A. Lock. Regd. office: 158, Falcon Road, S.W.11.

N. R. Kirk & Co., Ltd.—Registered 3rd February. Capital £5,000. To acquire the business of electrical engineers and contractors heretofore carried on by C. Stanley Tagg, Ltd., at 2/4, Uttoxeter New Road, Derby, recently contracted to be sold by the said company to N. R. Kirk. Directors: N. R. Kirk (chairman) and Mrs. Celia Kirk. Regd. office: 2 and 4, Uttoxeter New Road, Derby.

Brian Kille, Ltd.—Registered 3rd February. Capital £2,000. To acquire the business of radio and electrical engineers carried on by Walter B., Anthony C. and Olive Kille at Minehead, Somerset. Directors: W. B. Kille (permanent managing director), Olive Kille and A. C. Kille. Solicitors: Thorne & Bowman, Minehead.

Perseus Manufacturing Co., Ltd.—Registered 2nd February. Capital £5,000. To acquire the business of manufacturers and factors of electrical and radio apparatus now carried on by the administratrices of A. L. Dumelow at Saint Matthews Buildings, Branstone Road, Burton on Trent as Perseus Mfg. Co. Directors: Dorothy A. Dumelow, Doris Whitely, J. M. Whitely, W. A. Dumelow and R. L. Dumelow. Regd. office: St. Matthews Buildings, Branstone Road, Burton on Trent.

Storys (Ireland), Ltd.—Registered in Dublin 11th January. Capital £5,000. Electrical engineers and contractors, etc. Dr. Joseph Stone, 31, Palmerston Road, Dublin, is the first director.

Neon Displays, Ltd.—Registered 7th February. Capital £100. Neon and electric sign makers and erectors, etc. Permanent directors: W. B. Johnson and E. W. Kershaw Booth. Secretary: G. H. T. Allen. Regd. office: Office 58, 46, Fenwick Street, Liverpool, 2.

Increases of Capital

John Riley & Son (Electrical), Ltd.—Increased by £10,000, in £1 shares, beyond the registered capital of £10,000.

P. and L. Miller, Ltd.—Increased by £13,500, in £1 ordinary shares, beyond the registered capital of £1,500.

J. Stone & Co. (Deptford), Ltd.—Increased by £1,399,900, in £1 ordinary shares, beyond the registered capital of £100.

J. Stone & Co. (Charlton), Ltd.—Increased by £599,900, in £1 ordinary shares, beyond the registered capital of £100.

Electrical Components, Ltd.—Increased by £100,000, in £1 5½ per cent cumulative preference shares, beyond the registered capital of £250,000.

Cable Covers, Ltd.—Increased by £40,000, in £1 "B" ordinary shares, beyond the registered capital of £10,000.

Receivers Released

Ward Electrical Engineering Co., Ltd.—Mr. I. E. Gildey, of 92, Gloucester Place, W.1, ceased to act as receiver on 22nd January.

Dowsing Company (Electrical Manufacturers), Ltd.—Mr. F. W. Berringer, of 8, Widmore Road, Bromley, Kent, ceased to act as receiver and manager on 10th January.

Receiver Appointed

R. D. Masters & Co., Ltd.—T. H. Cochrane, of 12, Countess Croft, Cheylesmore, Coventry, was appointed receiver and manager on 17th January, 1951, under powers contained in debenture dated 16th June, 1950.

Companies Struck off the Register

The following companies were struck off the Register on 9th February and have been dissolved :—Articair Refrigerators, Ltd.; Betterset Radio, Ltd.; G. & L. Electrical Supply Co., Ltd.; Itonia Co., Ltd.; and Lonsdale Electrical & Mechanical Products, Ltd.

Bankruptcies

R. C. Alexander, electrical contractor, trading as Tees Electrical Installation Co., at 12, Mandale Road, Thornaby-on-Tees, and also formerly at 4, Barrington Street, South Shields.—First meeting, 16th February, at the Official Receiver's Office, 4, Bridge Road, Stockton-on-Tees. Public examination, 20th March, at the Court House, Stockton-on-Tees.

Liquidations

Bonnella Brothers (1936), Ltd., 1, Bucknall Street, London, W.C.2.—Winding up voluntarily. Liquidator, Mr. R. N. Russell, Coventry House, South Place, London, E.C.2.

British Electronic Appliances, Ltd., 341, Finchley Road, Hampstead, London, N.W.3.—Liquidator, Mr. A. W. Hunter, 185-188, High Holborn, London, W.C.1, released 17th January.

Eralite Mfg. Co., Ltd., 194, The Broadway, Wimbledon, London, S.W.19.—Liquidator, Mr. A. W. Hunter, 185-188, High Holborn, London, W.C.1, released 17th January.

Meetings of Creditors

Electrical Engineering & Advice Bureau, Ltd., 27, Regent Street, London, W.1.—Meeting of creditors, 21st February, at Room 401, Inveresk House, 346, Strand, London, W.C.2.

Premier Electric Services, Ltd.—Meeting of creditors on 20th February at the Leicester Chamber of Commerce, 3, Granby Street, Leicester.

Plastic Insulated Cables

AT a convention of Danish telephone engineers in Copenhagen recently Mr. H. F. Wilson (Telegraph Construction and Maintenance Co., Ltd.) delivered a lecture on plastic insulated cables for multi-channel carrier telephony.

Before outlining the characteristics and established uses of polyethylene he explained that its development was due to the I.C.I. in 1933 and that it was now commercially available in this country under the trade name "Alkathene," while processed or compounded polyethylene was marketed by his company under the name "Telcothene."

After dealing with the processing of "Telcothene" Mr. Wilson proceeded to discuss the various types of polyethylene cable used for carrier telephony and the techniques of design involved. He then passed on to plastic quad cables, comparing them with the normal type of air-spaced paper cable and discussing the various features of their design and application.

In conclusion, Mr. Wilson referred to the main hazards involved in the use of polyethylene under special conditions and outlined methods by which these difficulties could be overcome.

"Minibition" at Llandudno

IN view of the success of the first "Minibition" held by the Purchasing Officers' Association at Brighton last September, arrangements have been made for this exhibition to be repeated at the Craigside Hydro, Llandudno, from 27th to 30th September, in conjunction with the Association's 1951 conference. The "Minibition" is designed so that the maximum information regarding exhibitors' products can be displayed attractively and economically, the stands, all of one size, being situated adjacent to the main conference room. Stand reservations can be accepted from any company whose products are likely to interest buyers in industrial or public undertakings.

STOCKS and SHARES

THIS week has been notable for the coming into force of the Act for the nationalization by the Government of a number of steel companies. The operation has given rise to a considerable volume of business in nearly all the markets of the Stock Exchange. People who had money in steel companies have been selling the shares in some cases in order to obtain the higher yield which other industrial departments offer as compared with the new Steel Stock. On the other hand, big buyers have been taking steel shares as they came on offer, with a view to converting them into the new Steel Stock and thereby obtaining the latter at what may prove to be an advantageous price.

Week's Fluctuations

Industrial shares have generally improved as a result largely of these operations. Parsons, for example, at 4 are ⅛ higher, and Tube Investments, 6⅜, are similarly better. Associated Electrical Industries advanced to 87s 6d, Murex to 53s 6d, British Insulated Callender's to 35s, Johnson & Phillips to 65s, and London Electric to 47s 6d. The radio group is better, E.M.I. being a guinea. Even Radio & Television shares, at 10½d, are 4½d to the good. Oriental Telephones dropped to 38s 9d, Lucas to 36s 3d and Telephone Properties to 24s 6d.

Electrical Equipment Shares

Industrial markets have shown lately a certain amount of indecision between, on the one hand, Budgetary and political anxieties and, on the other, the promise of the approaching dividend season and the migration from steel shares into other industrials. Alternative accommodation offered by the market in electrical equipment shares continues to secure a very fair share of attention. Prices are correspondingly firm and now stand at a level which most people admit to be a little vulnerable, in some cases, should anything happen to spoil early dividend expectations.

Shares and Prices

Pye's issue of 5 per cent preference shares at 20s 9d attracted heavy over-subscription. Dealings in the allotment letters started on Tuesday last at 6d premium. The ordinary have risen to 21s 3d. Cossor 5s shares are fairly well maintained at about 11s 6d in advance of the preference dividend decision due next month, by when two years' payments will have accrued: the shares concerned stand at par. An interim is due shortly on E. K. Cole 5s shares, which are steady at 20s. Murphy Radio are expected to pay 10 per cent, in due course, as the first dividend to be declared since the 5s ordinary shares were marketed last year. At 8s 6d the shares would yield a little less than 6 per cent on that basis. McMichael 5s shares, at 5s 6d, stand around the best price for two years. If the dividend is maintained at 8 per cent, the yield will be 7½ per cent.

Shares on Offer

Reasonably large lines at present on offer in the electrical equipment market include Crabtree Electrical at 39s 3d and Hackbridge & Hewittic at 16s 3d, both yielding around 4½ per cent. British Thermostats at 30s 9d give 4⅛ per cent; Chloride Electric "A" at 58s 3d return 4¼ per cent on a 12½ per cent dividend basis, and London Electric Wire at 47s 6d afford a similar return. Parmiter, Hope & Sugden at 3s 3d, pay over 7½ per cent; and Marryat & Scott at 5s 1½d, show 8¾ per cent on the prospectus estimate of a 22½ per cent dividend.

Decca Results

Decca 1s ordinary shares responded with a rise of 1s, to 17s, on the company's dividend and profit announcement, and the news of an impending offer of new shares at 5s. The final dividend again makes 112½ per cent for the year ended last March, and an interim, at the same rate as before, is declared for the period now running. Trading profits increased, but bigger charges for depreciation and interest reduced the net figure (excluding special items) to about half the previous year's. The Navigator Company contributed a substantial profit this time, and in all sections the group's turnover this year is stated to show a marked increase. Rights to the new shares, offered in the ratio of one for every ten held, will be worth over 1s per share if the old shares keep their present quotation.

Brazilian Traction Expansion

Brazilian Traction Light & Power is domiciled in Canada, and although the scene of operations is, of course, in Brazil, the shares have felt the benefit of interest directed towards the dollar area. They have been in the news lately through the report of a further loan by the World Bank. This is designed to assist the company's needs for foreign currency in pursuance of the expansion programme. Apparently the undertaking is expected to finance local expenditure from earnings. This, it is thought, may restrict the scope for an early increase in the present dividend rate of $2 per share. The latter, however, provides a yield of about 8 per cent at the present price of $44 and the market considers this good enough, while development is in progress.

NEXT WEEK'S EVENTS

Monday, 19th February

BRISTOL.—Electricity House, Colston Avenue, 6 p.m. I.E.E. Western Supply Group. "The Design, Specification and Performance of High-Voltage Surge Diverters," by H. F. Jones and C. J. O. Garrard.

LIVERPOOL.—At the Royal Institution, Colquitt Street, 6.30 p.m. I.E.E. Mersey and North Wales Centre. "Some Notes on Electrical Installations in Large Chemical Factories," by D. B. Hogg. (Joint meeting with the Liverpool Engineering Society.)

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio Section. Discussion on "Is there an Optimum Speed for a Gramophone Record?" opened by Dr. G. F. Dutton.

St. Ermin's Hotel, S.W.1, 6.50 p.m. A.S.E.E. Central London Branch. "Mercury Arc Rectifiers," by K. B. Blake.

NEWCASTLE-ON-TYNE.—King's College, 6.15 p.m. I.E.E. North-Eastern Radio and Measurements Group. "A Simplified Method for Checking the Orientation of the Optic Axis of Meter Jewels" and "A Sensitive Balance for Stability Tests on Permanent Magnets," by S. F. Knight.

Tuesday, 20th February

BIRMINGHAM.—M.E.B. Showrooms, Paradise Street, 7 p.m. E.P.E.A. Midland Technical Group. "The New Walsall Power Station," by A. E. Farmer.

LEEDS.—Lighting Service Bureau, 24, Aire Street, 6.30 p.m. I.E.E. North Midland Utilization Group. "The Cost and Efficiency of Earthing on Low- and Medium-Voltage Overhead Line Systems," by L. Gosland.

LIVERPOOL.—Merseyside and North Wales E.B. Service Centre, 6 p.m. I.E.S. Liverpool Centre. "The Operation and Maintenance of Fluorescent Lighting Installations," by G. D. Jones-Thomas and W. A. R. Stoyle.

LONDON.—Savoy Place, W.C.2, 7 p.m. I.E.E' London Students' Section. "Parallel Conductors,'. by E. J. Holmes.

Lighting Service Bureau, 2, Savoy Hill, W.C.2, 6.30 p.m. Association of Supervising Electrical Engineers. "Accidents and the Supervising Electrical Engineer's Responsibilities," by E. Midgley.

At the Institution of Mechanical Engineers, Storey's Gate, S.W.1, 5.30 p.m. Institute of Fuel. "Developments in the Firing of Shell Boilers by Means of Chain-Grate Stokers," by C. H. G. Hayward.

47, Belgrave Square, S.W.1, 5.30 p.m. Institute of Physics. "Electronics and the M.K.S. System of Units," by G. F. Nicholson.

LOUGHBOROUGH.—Technical College, 6.30 p.m. I.E.E. East Midland Centre. Junior members' night.

MALVERN.—Winter Gardens, 7 p.m. I.E.E. South Midland Centre. District meeting. "Some Electrical Methods of Measuring Mechanical Quantities," by F. J. Woodcock.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Supply Group. "Design of Power Transformers to withstand Surges due to Lightning, with special reference to a New Type of Winding," by A. T. Chadwick, J. M. Ferguson, D. H. Ryder and G. F. Stearn. "The Design and Performance of Surge Divertors for the Protection of Alternating-Current Systems," by T. F. Monahan.

Wednesday, 21st February

HULL.—Y.E.B. Offices, Ferensway, 7.30 p.m. I.E.E. North Midland Centre. District meeting. "The Phase/Neutral System of Supply for Rural H.V. Distribution," by G. T. Garwood and G. J. Websdale.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Supply Section. "Transient Theory of Synchronous Generators Connected to Power Systems," by B. Adkins.

I.E.E. London Students' Section, 2 p.m. Visit to Ford Motor Co., Ltd., Dagenham.

Lighting Service Bureau, 2, Savoy Hill, W.C.2. 6.30 p.m. Institution of Engineers-in-Charge. "Electric Lamps," by A. D. S. Atkinson.

At the Institution of Civil Engineers. Iron and Steel Institute. Symposium on High-Temperature Steels and Alloys for Gas Turbines. (Continued on 22nd February.)

LUTON.—Chamber of Commerce, George Street West, 7.30 p.m. Luton Electrical Society. "Modern Telecommunications," by W. Sampson.

MANCHESTER.—Engineers' Club, Albert Square, 6.30 p.m. I.E.E. North-Western Radio Group. Informal lecture on "Some Engineering Aspects of the Development of Television Broadcasting," by J. L. Bliss.

PRESTON.—Harris Institute, 7 p.m. I.E.E. North Lancashire Sub-Centre. "The Electrical Equipment of Diesel-Electric Locomotives and Motor-Coach Trains," by P. L. Mardis and W. G. Jowett.

SALISBURY.—Guildhall, 7.30 p.m. I.E.E. Southern Centre. "The Provision of Technical Studies in Universities and Technical Colleges," by Dr. D. S. Anderson. (Joint meeting with the Institutions of Mechanical and Civil Engineers.)

SHEFFIELD.—Grand Hotel, 6.30 p.m. I.E.E. Sheffield Sub-Centre. "Polyphase Commutator Machines," by B. Adkins and W. J. Gibbs.

TAUNTON.—Electricity Offices, 3 p.m. I.E.E. South-Western Sub-Centre. "The Performance of the British Grid System in Thunderstorms," by Dr. J. S. Forrest.

Thursday, 22nd February

BRADFORD.—Y.E.B. Offices, 45–53, Sunbridge Road, 7.30 p.m. I.E.S. Bradford Group. "Sight and Light," by J. Benson.

LONDON.—Grosvenor House, Park Lane, W.1. 7 for 7.30 p.m. Institution of Electrical Engineers, Annual dinner.

Friday, 23rd February

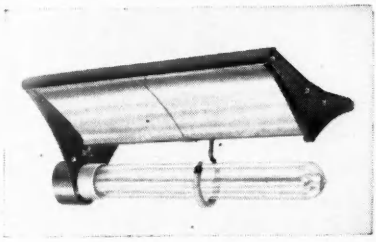
WEYMOUTH.—Technical College, 6.30 p.m. I.E.E. Southern Centre. "Magnetic Amplifiers," by A. G. Milnes.

RECENT INTRODUCTIONS

NOTES ON NEW ELECTRICAL AND ALLIED PRODUCTS

Sodium Lantern

AN economical and efficient method of using sodium lamps for main road lighting is provided by a new open type lantern with an optical system consisting of four curved mirrors in the "Seagull" arrangement. The lantern is protected by a galvanized and stove-enamelled top canopy. Either an 85 W or 140 W "Osram" sodium lamp may be used. Although the lantern is designed primarily for lighting roads between 30ft and 40ft wide, the horizontal



G.E.C. open type lantern for 85 W or 140 W sodium lamps

position of the light source gives better results on roads over 40ft in width than are obtainable with a vertical lamp. The iron end castings of the lantern are held together by four tie rods, the centre pair carrying a pressed steel bracket reinforced and tapped for top entry mounting. This lantern is a product of the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2.

Potato Eye Remover

By using the "Streamline" potato eye remover made by the CONCENTRIC MANUFACTURING CO., LTD., Tyburn Road, Birmingham, one person can eye potatoes at four times the speed possible with an ordinary knife and also reduce the wastage by one half. The stainless steel eyeing drill, which revolves at 1,200 r.p.m., has been specially designed to avoid any injury to the operator's hands, while a thick rubber flex union piece and waterproof casing prevent entry of water to the electrical circuit. Interchangeable with the eyeing drill is an extra tool for coring apples.

The machine has an aluminium casing, mounted on a cast aluminium alloy base which can be screwed on to a bench. The loading is 50 W and the price is £4 10s, plus 15s for the apple corer if required.

Neon Indicator Lamps

A neon signal lamp for direct connection to the mains is being made by ARCOLECTRIC (SWITCHES), LTD., Central Avenue, West Molesey, Surrey. It is designed to be fixed in a single 0·5in hole. The angle of visibility of the lamp is 180 deg. Transparent covers are supplied in red, amber, yellow and clear; they can be provided separately and engraved covers can be manufactured to order. This lamp, which normally operates on 200/250 V mains, is supplied with two 6in leads, in one of which the dropping resistance is incorporated.

Long-Life Batteries

The Dagenite "Dual-Life" battery is again being marketed by HOLSUN BATTERIES, LTD., 137, Victoria Street, London, S.W.1. It embodies a new method of plate separation which improves performance and lengthens the life of the battery. Plate separation is by an envelope of microporous plastic material which encloses the negative plate, thus guarding against internal short circuits. This envelope is extremely tough but at the same time so porous that the acid passes freely through it.

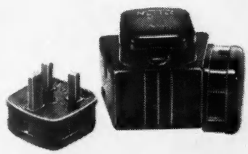
These batteries are available in 6 V and 12 V sizes.

Fused Adaptor

We have received particulars from NETTLE ACCESSORIES, LTD., Harper Road, Wythenshawe,

"Streamline" potato eye remover

"Nettle" three-way 13 A fused adaptor



Manchester, of their new 13 A fused three-way socket outlet adaptor, which can be used with all socket outlets designed in accordance with B.S.1363. Overloading of the socket outlet is prevented by the provision of an easily replaced 13 A fuse contained in its own carrier in the adaptor. This obviates the necessity of dismantling the adaptor for fuse replacement. Polarity is similar on all outlets.

"Mazda" dustproof fluorescent lighting fitting

Dustproof Fluorescent Fitting

A new fluorescent lighting fitting produced by the BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, London, W.C.2, is intended for such situations as mine roadways, where flameproof equipment is not necessarily required but there is a need for a lighting fitting of robust construction that will protect the lamp and its auxiliary gear from the surrounding atmosphere. It is also suitable for such premises as cotton mills, flour mills and other dusty places. It comprises a cast aluminium alloy channel housing the gear tray, and a clear "Perspex" detachable protecting cylinder enclosing the lamp. The standard fitting uses a single 80 W 5ft lamp but similar units can be made for use with 4ft 40 W, 2ft 40 W or 2ft 20 W lamps. When the fitting is to be installed in mine roadways a cable gland is provided for s.w.a. cable. For other industrial applications the end cap is supplied with conduit entry. Suspension is by means of two adjustable straps round the back channel.

Warnings of Power Cuts

Yorkshire Board's Radio Scheme

AFTER examining methods of warning industrial consumers of intended load shedding, the Yorkshire Electricity Board has decided that the only practical way is to use the Board's existing short wave radio transmitters. There are three of these, at Thornhill, Otley and Silsden, capable of covering about a third of the Area, if equipment could be obtained which, on transmission of signals, would call up any one of five groups of consumers.

Inquiries having revealed that such a scheme presented no serious technical difficulty, the necessary application was made to the Post Office. This involved the Post Office in a considerable departure from normal practice as licences so far issued cover solely transmission from a fixed station to one or more mobile stations. Permission has now been given for preliminary experiments to be carried out and prototype equipment has been made available by the General Electric Co., Ltd. The initial tests will be made in the Dewsbury District using the Thornhill transmitter. It is pointed out that nothing more than experimental work can be carried out this winter. If the scheme is successful and sufficient receivers are available, it should be possible to operate a fairly extensive warning system during next winter. The receivers will be available in general to industrial consumers; it is stated that the cost to the consumer will be approximately £50 per receiver. To be effective load shedding must be carried out very quickly and the advance notice which can be given will be approximately three minutes, sufficient to permit loads slung on cranes to be lowered to the floor and moving machinery to be stopped. The signal will consist of a bell which will ring continuously until stopped by hand, and a light signal. Any number of these can be placed round a factory. The Board states that v.h.f. radio is "decidedly temperamental" and there may be a number of blind spots where reception of the signals will be impossible.

Cyprus Telephone Developments

THE internal telephone service of Cyprus is shortly to be developed by the introduction of automatic operation in Nicosia, Limassol and Famagusta, and by the addition of overseas radio-telephone links. Cable & Wireless, Ltd., which operates the Cyprus service, announces that automatic operation will be substituted for the present manual system in Nicosia during August, and that it will be extended to Limassol and Famagusta in 1952. There are about 2,600 public subscribers in Cyprus, of whom 850 are in Nicosia, 460 in Limassol and 400 in Famagusta. On the introduction of the automatic system the number will be substantially increased. The link with the United Kingdom is expected to be opened in March. It is hoped that links with Israel, Greece and Egypt will be added later.

Wrotham Transmitting Station

Experimental V.H.F. Broadcasting

IN 1945 the B.B.C. began a series of tests to get first-hand information on the possibilities of broadcasting on very high frequencies (v.h.f.). Although comprehensive, these tests did not show conclusively whether amplitude modulation (a.m.) or frequency modulation (f.m.) would be superior for this purpose, and it was decided to carry out comparative tests on a long term basis at high power. To this end a new transmitting station has been built on Wrotham Hill about 20 miles south-east of London, from which experimental transmissions have been made for the past few months.

This station consists of a single-storey brick building and a 470ft mast, the base of which is 730ft above sea level. The building, which is similar to that of the Sutton Coldfield television station, has two wings, in one of which are the a.m. and f.m. transmitters, a control room, and auxiliary equipment and in the other a quality-checking room, offices, and canteen.

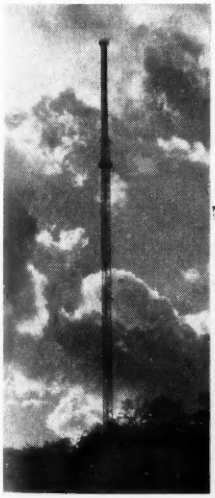
The f.m. transmitter, made by Marconi's Wireless Telegraph Co., Ltd., has a power of 25 kW and operates on a mean carrier frequency of 91·4 Mc/s with a maximum deviation of ± 75 kc/s. Supplies at 6 kV and 3 kV for the valve anodes are obtained from hot-cathode mercury-vapour rectifiers in the power-conversion plant, which is installed behind the transmitter. The filaments of all the valves are a.c. heated.

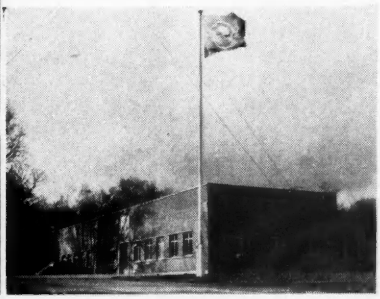
The a.m. transmitter, made by the same company, has an unmodulated power of 18 kW and operates on a carrier frequency of 93·8 Mc/s. Supplies at 9 kV, 4·5 kV and 3 kV are obtained from hot-cathode mercury-vapour rectifier equipment behind the transmitter.

Both transmitters are controlled and monitored in a single kiosk with windows looking into the transmitter hall. On each control desk are switches controlling the supplies to the various stages of the transmitters and meters indicating the voltages and currents to them. Monitoring equipment is also installed for measuring the frequency deviation due to modulation and for checking any shift in the mean carrier frequency.

Air-blast cooling is used throughout in both transmitters. The air can either be circulated round a closed system, in order that it may attain its working temperature quickly, or be drawn in from outside the building. During cold weather the air can be discharged into the transmitter hall to warm it. Motor driven dampers operated by thermostats control the circulation of the air automatically.

A concentric feeder connects the output of each transmitter, through a change-over switch, either to the feeders leading to the aerial or to test loads. The aerial mast is about 50 yd





Experimental transmitting station at Wrotham, Kent, with a view of the 470ft mast erected 730ft above sea level

from the transmitter building. It consists of a lattice steel support mast 360ft high, on top of which is a cylindrical section 110ft long and 6·5ft in diameter, which with the slots in its surface forms the v.h.f. aerial system. The support mast has a triangular cross-section, each face being 9ft across, and rests on a ball joint which permits of angular movement under wind pressure; nine stays hold the mast erect. It was designed and built by British Insulated Callender's Construction Co., Ltd.

The station is supplied with three-phase 50 c/s power at 11 kV by duplicate feeders, which terminate at switchgear in a sub-station near the transmitter building. This supply is transformed down to 415 V and distributed from the low-voltage switch-room in the transmitter building to the transmitters and auxiliary equipment. A 50 V supply for the transmitter control circuits is obtained from metal rectifiers, and there is a 240 V battery for emergency lighting.

Busbar Lighting System

Convenient and Adaptable Equipment

A LOW voltage busbar lighting system has been introduced by Pruden & Pope, 38, Church Road, London, S.E.19; it is distributed by the Sloan Electrical Co., Ltd., 41, Kingsway, London, W.C.2. This (the "Slide-Along") system is easily installed in any type of building and can be altered or extended at any time.

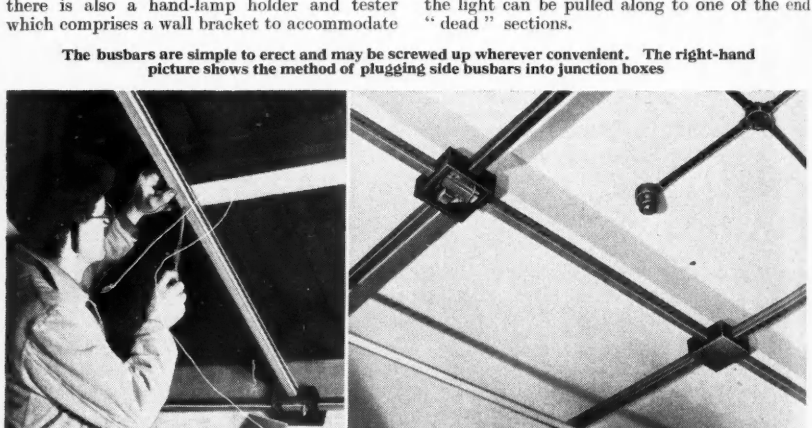
The busbar is made in two lengths, 10ft or 6ft 6in, from hardwood with integral brass current carrying strips and end connections. The junction box can be moved to different positions on any busbar length, without taking down the busbar on which it slides, and it is so designed that other busbars can be plugged into it at right angles.

A hand-lamp, which takes lamps up to 60 W, is provided with a positive grip and may be moved along without removal from the busbar, and there is also a hand-lamp holder and tester which comprises a wall bracket to accommodate groups of hand-lamps; a test strip is provided at one end.

The makers can also supply 25 V double wound output transformers for use with this system. Other accessories include a metal shield which encloses the busbar except for a slot 0·75in wide on the underside; and alternative fittings which slide along without being removable from the busbar and are either fitted with key-switch holders, or can slide over "dead" sections in the busbars, usually at the ends.

Thus, for premises having many "filing corridors," or store bins and racks, a "Slide-Along" busbar with one or more lamps can be fitted in each corridor. On entering the corridor the operator has only to pull the light along with him and it will immediately go on. On leaving, the light can be pulled along to one of the end "dead" sections.

The busbars are simple to erect and may be screwed up wherever convenient. The right-hand picture shows the method of plugging side busbars into junction boxes



ELECTRICITY SUPPLY

Effect of Coal Price Increase
New Power Station at Belfast

THE British Electricity Authority and the Area Electricity Boards have for some time had in preparation revised tariffs to cover the effect of increased costs and charges on their trading operations in the next few years. The increase in the price of coal of 4s 2d a ton now announced will add some £7,500,000 per annum to the cost of electricity generation. Part of this increase will be passed on automatically to those consumers, mainly industrial, who are supplied on tariffs that include a coal-price adjustment clause.

The net additional cost to the industry not recovered in this way will be roughly £3,500,000. There is no margin to cover this in present tariffs, and the Authority is therefore calling on the Area Boards to submit proposals with a view to spreading the increased coal costs amongst all consumers. The Authority's request to the Boards will ensure that the new burden is taken into account together with any other upward tariff adjustments which individual Boards may find necessary.

Inverness-shire Transmission Lines

The Secretary of State for Scotland (Mr. Hector McNeil) has confirmed a Scheme prepared by the North of Scotland Hydro-Electric Board for the erection of overhead transmission lines in Inverness-shire from Fasnakyle transforming station to a new transforming station to be erection near Fort Augustus. The lines, estimated to cost £374,000, will be a further extension of the grid system in the north of Scotland and will be connected later to the generating stations of the Garry and Moriston projects. The Amenity Committee was consulted about the possible effects but only one objection was lodged against the Scheme and the Secretary of State did not consider it necessary to hold an inquiry, which was not asked for by the objector.

Contract for New Belfast Station

Plans for plant for the new Victoria power station at Belfast Harbour, submitted by Mr. W. M'C. Girvan, city electrical engineer, to the Electricity Committee on 5th February, envisage an immediate outlay of £1,975,490. Mr. Girvan, in his report, emphasized the necessity to have the new station in operation in 1953–54 to meet the growing demand. The new plant will have a capacity of 60,000 kW, which is the limit of concentration permitted by the Ministry of Commerce. The entire scheme is to cost ultimately £4,125,000. Mr. Girvan urges the immediate placing of provisional contracts as follows:—Water tube boilers and equipment (£1,204,980), Clarke, Chapman & Co., Ltd.; 30,000 kW turbo-alternator and equipment (£632,100), C. A. Parsons & Co., Ltd.; high-pressure pipework and valves (£110,250), Stewarts & Lloyds, Ltd.; dust collecting plant (£28,160), B.V.C. Industrial Constructions, Ltd.

Less Load Shedding in N.E.

Figures issued by the Northern Regional Board for Industry show that from 1st September last year to 26th January this year load shedding in the Area had taken place on 39 days and the time involved was 146 hours. In the previous winter, cuts took place on 62 days and totalled 191 hours. The Board's appeal to industrial and commercial consumers to reduce demand at peak periods had reduced the frequency and severity of the cuts.

Appeal Against "Fine"

Through using electricity at a peak period for water supply purposes Salisbury City Council incurred a penalty of £150. At last week's meeting of the City Council the engineer, Mr. H. Rackham, reported that it was agreed to honour an undertaking not to use electricity during the peak periods, but when machinery at a pumping station broke down the electrical stand-by plant was used. Alderman E. J. Case said that if the stand-by plant had not been used thousands of people would have been without water. The Council decided to report the circumstances to the Electricity Board and to ask for the "fine" to be waived.

Coal Stocks and the Weather

The weekly statistics issued by the Ministry of Fuel and Power record a sharp rise in the consumption of coal at power stations in the week ended 2nd February when 811,600 tons was used against 762,000 tons in the previous week. Commenting on this, the Ministry states that it was the result of the cold weather experienced at the beginning of that week. The special measures taken to build up electricity stocks have resulted in an increase of 22,000 tons (not quite one day's consumption) between

20th and 27th January, but while these measures are being continued their success depends to a substantial degree upon the temperature. At 2nd February stocks totalled 2,520,500 tons, equivalent to 3·2 winter weeks' consumption.

In the week ended 2nd February 1,260·6 million kWh was sent out for public supply from solid fuel fired stations, compared with 1,185·1 million in the preceding week.

New Collier Launched

On 6th February the steam driven collier *Brimsdown*, built to the order of the British Electricity Authority, was launched from the yard of the Burntisland Shipbuilding Co., Ltd. As the new ship left the ways the naming ceremony was performed by Mrs. W. S. Lewis, wife of Alderman W. S. Lewis, chairman of the Midlands Electricity Board.

Damodar Valley Scheme

According to *Indian Trade and Industry* the estimated cost of the Damodar Valley project, originally put at £41·25 million, is likely to be 60 per cent higher. The causes are devaluation, increases in prices of labour and materials, and an enlargement of the scope of the scheme. One item which is to be extended is the transmission system from the Bokaro thermal station which will be 475 miles instead of 125 miles. The Budget for 1950–51 provides for the expenditure of about £10 million on the scheme ; about 70 per cent of this will relate to the Bokaro station.

Fluorescent Lighting in France

Last month a meeting was held in Paris of representatives of Electricité de France (the national electricity supply authority), the Syndicat des Fabricants Français de Lampes Electriques (the lamp manufacturers) and the Fédération Nationale de l'Equipement Electrique (the installation concerns). The purpose was to discuss methods of applying the regulations relating to fluorescent lamps drawn up by the Union Technique de l'Electricité. Electricité de France agreed to confirm instructions already given to its distribution centres to take the necessary measures to secure the observance of the regulations and to refuse to connect installations not conforming to them. The lamp makers undertook to produce, and the installation concerns agreed to sell, install or recommend to customers only fluorescent lamps which conformed to the rules. Electricité de France, with the support of the other parties, is to employ all possible publicity methods to persuade the public to use only fluorescent lamps meeting the requirements of the Union Technique.

New Indian Station

A 30,000 kW power station was recently started up at Khaperkheda, near Nagpur, India. At the opening ceremony Lt. Col. E. G. Mackie, chief engineer, Electricity Department, said that the station would feed what was known as the "Southern Grid." From the station about 800 miles of transmission lines radiated to substations situated in twenty-one towns. It was the Government's intention to develop the rural areas round these towns and then extend until all the areas were interconnected.

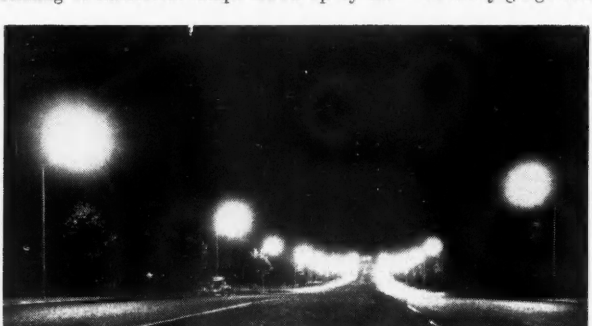
Street Lighting

Manchester Corporation Highways Committee recommends that the conversion of the gas lighting on Wilmslow Road to electricity should be proceeded with at a cost of £5,500.

Malden & Coombe Corporation is recommended to approve a scheme for the provision of improved street lighting in Traps Lane and Coombe Lane (£6,100).

Perth (W.A.) Highway Lighting

The new highway in Kings Park, Perth, Western Australia, has been illuminated by Benjamin 500 W "Rodalux" lighting fittings, each finished in "Crysteel" vitreous enamel on heavy gauge steel, suitable for outdoor use. The fittings have a mounting height of 25ft at 115ft spacing both sides of the double roadway. Both drives are 30ft wide with a 20ft "nature" strip between. The installation was carried out by the engineer of the State Electricity Commission of Western Australia.



Benjamin lighting fittings on the new highway in Kings Park, Perth, Western Australia

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1946

5055. Borg-Warner Corporation.—Variable ratio torque transmitting mechanisms. 26th February, 1946. (651251.)

1947

6464. Standard Telephones & Cables, Ltd.—Electric discharge tube. 7th March, 1947. (651255.)

7537. Philco Corporation.—Grid-controlled electron tubes. 17th March, 1947. (651196.)

32377. Philips Lamps, Ltd.—Circuit-arrangements for producing sawtooth current in an inductance coil. 7th May, 1947. (651257.)

17200. Sperry Gyroscope Co., Inc.—Electron-discharge tubes of the velocity-modulation type. 30th June, 1947. (651258.)

18195. Marconi's Wireless Telegraph Co., Ltd.—Navigation aiding radio systems. 9th July, 1947. (651259.)

31087. British Thomson-Houston Co., Ltd.—Dash-pots for damping systems. 24th November, 1947. (651261.)

31658. Tesla, Electrical & Radio Industry, National Corporation.—Valve voltmeter. 30th December, 1947. (651213.)

31834. Staatsbedrijf der Posterijen Telegrafie en Telefonie.—Automatic telegraph or telephone system with registers, directly controlling the selecting stages. 30th December, 1947. (651264.)

1948

459. British United Shoe Machinery Co., Ltd. (United Shoe Machinery Corporation).—Machines adapted for progressively seaming together two or more layers of sheet material by use of the heating effect of a high-frequency electric field. 6th January, 1949. (651071.)

1197. Autophon Akt.-Ges.—Magnetic dictaphone. 14th January, 1948. (651345.)

3212. Hackbridge & Hewittic Electric Co., Ltd., and Cuson, G. S.—Mercury arc rectifiers. 22nd December, 1948. (651272.)

1011. Wiegand Co., E. L.—Electric heating elements and method of making same. 11th February, 1948. (651274.)

1599. Alloy Research Corporation.—Electrolytic polishing of stainless steel. 17th February, 1948. (651077.)

4772. Metropolitan-Vickers Electrical Co., Ltd.—Apparatus for observing rotating objects. 18th February, 1948. (651277.)

5643. British Thomson-Houston Co., Ltd.—Internal-combustion engine ignition systems. 25th February, 1948. (651219.)

5963. Director of the Office of Technical Services, Department of Commerce.—Antenna. 27th February, 1948. (651285.)

5995. Director of the Office of Technical Services, Department of Commerce.—Circuits for modulating or interrupting radio frequency oscillations. 27th February, 1948. (651220.)

5999. Director of the Office of Technical Services, Department of Commerce.—Amplitude modulation of radio-frequency waves. 27th February, 1948. (651080.)

6896. Brown & Sharpe Mfg. Co.—Tools operated by electric motors of the oscillating armature type. 5th March, 1948. (651083.)

8539. National Cash Register Co.—Electronic numerical accumulators. 23rd March, 1948. (651086.)

8578. Radio Corporation of America.—Time division pulse multi-flex radio communication systems. 23rd March, 1948. (651290.)

8681. Telefonaktiebolaget L. M. Ericsson.—Frequency modulators. 24th March, 1948. (651087.)

8766. Metropolitan-Vickers Electrical Co., Ltd., and Stuart-Williams, R.—Thermionic valve oscillators. 14th February, 1949. (651291.)

9221. Murex Welding Processes, Ltd., Rollason, E. C., and Sharratt, E.—Arc welding electrodes for deep penetration welding of steel. 30th March, 1949. (651136.)

9334. Brush Development Co.—Magnetic transducing apparatus. 2nd April, 1948. (651293.)

9614. Warthen, sen., C. F.—Electrostatic a.c. generator. 6th April, 1948. (651295.)

9786. Compagnie Générale d'Electricité.—Oil pressure reservoirs for electric cables. 7th April, 1948. (651141.)

10249. British Thomson-Houston Co., Ltd.—Electric switches suitable for the heat-control of blankets. 13th April, 1948. (651143.)

10856. Westinghouse Electric International Co.—Electrostatic precipitators. 20th April, 1948. (651301.)

11794. British Thomson-Houston Co., Ltd.—Magneto-electric machines. 29th April, 1948. (651223.)

11813. Clang, Ltd., and Austen, H. E.—A.c. tumbler switches. 29th April, 1948. (651148.)

13271. Ericsson Telephones, Ltd., and Wilman, C. W.—Devices operated by magnetostriction or thermal expansion. 10th May, 1949. (651151.)

13706. Metropolitan-Vickers Electrical Co., Ltd., and Kendall, J. T.—Voltage transformation of electrical energy. 19th May, 1949. (651153.)

14212. Liquidometer Corporation.—Electrical transmitter for a liquid level. 26th May, 1948. (651306.)

15520. Crabtree & Co., Ltd., J. A., Besag, E., and Wintle, T. D. G.—Automatic circuit-breakers and similar electrical switchgear. 29th October, 1948. (651312.)

15695. Henley's Telegraph Works Co., Ltd., W. T., and Smith, E. A.—Automatic electrically-actuated indicating devices. 10th June, 1949. (651346.)

16213. Richards, G. W. F., King, D. H., and Hunt, G. J.—Electric fires and convection heaters. 30th May, 1949. (651159.)

16267. Precision Electrical Products (Stockport), Ltd., and Stenton, J. M.—Electric kitchen control units. 8th June, 1949. (651314.)

17741. Electro Mecanique de l'Aveyron.—Devices to prevent overheating of the bearings of rotary shafts, in particular shafts of electrical apparatus such as electric brakes. 1st July, 1948. (651164.)

17892. Crompton & Knowles Loom Works.—Photo-electric weft detector for loom. 2nd July, 1948. (651348.)

19455. Soc. Rateau, and Auxionnaz, R.—Gas turbine plant with semi-open circuit. 20th July, 1948. (651166.)

19676. Siemens-Schuckert (Gt. Britain), Ltd., and Leigh, F. S. J.—Lighting circuits, more especially underground lighting circuits, designed with earth leakage protection. 16th May, 1949. (651351.)

19787. Blackburn & General Aircraft, Ltd., Saunders, C. G., and Piper, R. H.—Electromagnetic movement damping devices. 25th July, 1949. (651224.)

19943. Stone & Co., Ltd., J., Nixon, L. R., and Vickery, E. C. Electrical train-lighting installations. 2nd May, 1949. (651353.)

21193. General Electric Co., Ltd., and Collins, L.—Thermionic valve amplifiers. 11th August, 1949. (651359.)

21735. Ganz es Tarsa Villamossagi, Gep-, Waggon- es Hajogyar R.T.—Rotors for turbo-generators. 17th August, 1948. (651169.)

23869. Bendix Aviation Corporation.—Systems for regulating the frequency of a.c. generators. 10th September, 1948. (651178.)

24135. General Electric Co., Ltd., Nelson, E. H., and Power, E. B.—Seal-bodies comprising a conductive path hermetically sealed through a vitreous wall. 7th September, 1949. (651179.)

25808. British Thomson-Houston Co., Ltd.—Means for retaining the windings of dynamo-electric machines. 4th October, 1948. (651183.)

26026. Brewerton, A. E.—Extracting devices particularly for the valves of electronic devices. 13th September, 1949. (651184.)

26687. Metropolitan-Vickers Electrical Co., Ltd.—Radio receiving apparatus. 13th October, 1948. (651226.)

26750. Borg-Warner Corporation.—Torque transmitting mechanisms. 26th February, 1946. (651316.)

26833. Standard Telephones & Cables, Ltd.—Electric pulse communication system. 15th October, 1948. (651088.)

27953. Philips Electrical, Ltd., Davis, C. W. V., and Westwood, H. W.—Magnetic separators. 27th October, 1948. (651096.)

28010. Western Electric Co., Inc.—Telephone transmitters. 28th October, 1948. (651378.)

28038. Metropolitan-Vickers Electrical Co., Ltd., Mulligan, J. W., Gray, A. H., and Wilson, J. S.—Dynamic braking of induction motors. 24th November, 1949. (651379.)

29188. Imperial Chemical Industries, Ltd., Rudge, A. J., and Howell, W. N.—Electrical connections to the anodes in fluorine cells. 9th November, 1949. (651107.)

29374. Mond Nickel Co., Ltd.—Electrically-heated molten salt baths used in heat-treatment furnaces. 11th November, 1948. (651233.)

30705. Standard Telephones & Cables, Ltd.—Electric pulse communication system. 26th November, 1948. (651115.)

31136. Escher Wyss, Ltd.—Device for electrically actuating a control member from a plurality of service points. 1st December, 1948. (651118.)

31825. Bulpitt & Sons, Ltd., and Tyler, A.—Automatic safety switches for electrically-heated utensils and machines. 8th December, 1949. (651243.)

32146. Cinema-Television, Ltd., and Jesty, L. —Methods and apparatus for recording television or like pictures on kinematographic film. 8th November, 1949. (651385.)

32310. Westinghouse Electric International C —Commutators for dynamo-electric machines. 7th December, 1948. (651244.)

32328. Cinema-Television, Ltd., and Buchanan, W. H. —Cathode-ray tubes. 8th November, 1949. (651386.)

32364. Soc. Industrielle de Liaisons Electrique —Armouring for electric cables. 14th December. 1948. (651245.)

32464. Metropoitan-Vickers Electrical Co., Ltd., and Hall, J. S.—Steam turbine plant. 15th December, 1949. (651246.)

32576. Hoover, Ltd., and Haydon, E. K.—Electric snap-action switches. 14th December, 1949. (651127.)

33660. Compagnie Générale d'Electricité.—Binding of electric cables. 31st December, 1948. (651131.)

1949

27667. Allmanna Svenska Elektriska Aktiebolaget, and Falknas, O.—Transformer, reactor or other laminated magnetic cores. 28th October, 1949. (651189.)

31423. British Thomson-Houston Co., Ltd.—Automatic control apparatus for water heaters. 7th December, 1949. (651191.)

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered within a month of the dates mentioned:—

31st January

PANTHA.—No. 692,421, Class 7. Portable electrically-driven tools. No. 692,422, Class 9. Electric blowers, and electrically-operated vacuum cleaners, all being articles incorporating fractional-horse-power electric motors. No. 692,423, Class 11. Electrically-operated hairdryers and electric fans, all being articles incorporating fractional-horse-power electric motors.—Leonard Heys, Ltd., Faraday House, Henry Street, Blackpool.

OCTOPUS.—No. 688,193, Class 9. Cables, flexible conductors, switches, switch boxes, plug sockets, junction terminal boxes and assembly terminal blocks, all being electrical goods.—Hartley Electromotives, Ltd., 57, Victoria Street, London, S.W.1.

STURDEX.—No. 692,414, Class 9. Electrical apparatus and parts thereof and fittings therefor, all included in Class 9.—J. A. Crabtree & Co., Ltd., Lincoln Road, Walsall, Staffs.

VELO TROL (design).—No. 692,467, Class 9. Electric current rectifiers.—Hackbridge & Hewittic Electric Co., Ltd., Hersham, Surrey.

ELECTROMAZE.—No. 693,037, Class 11. Electrostatic air and gas filters (not for scientific purposes and not being parts of engines, of motors or of machines).—Air-Maze, Ltd., Church Street, Warrington.

7th February

KUB. No. B692,091, Class 8. Electric shaving instruments and parts thereof included in Class 8.—Chilton Aircraft Co., Ltd., Hungerford, Berks.

MEM. No. 669,914, Class 9. Switches, contacts, fuses, transformers, terminals and electricity-storage battery chargers, all being electrical appliances or apparatus; and electric apparatus for use in the control of electric motors.—Midland Electric Manufacturing Co., Ltd., M.E.M. Works, Reddings Lane, Tyseley, Birmingham, 11.

ACEX. No. 692,413, Class 9. Switches, plugs, sockets, bell pushes and switch fuses, all being electrical goods.—J. A. Crabtree & Co., Ltd., Lincoln Works, Lincoln Road, Walsall, Staffs.

PIGEBESTAL. No. 692,997, Class 9. Asbestos-insulated, aluminium-sheathed electric conductors or cables. PIGEMULTIFLO. No. 692,998, Class 17. Multi-channelled flexible conduits made solely or mainly of plastics.—Pirelli-General Cable Works, Ltd., 343-345, Euston Road, London, N.W.1.

LIDO. No. B693,372, Class 9. Wireless, television and telegraphic instruments and apparatus, gramophones; and parts included in Class 9 of all such goods; electric batteries; and cases for electric torches or for electric pocket lamps; but not including wire.—Vidor, Ltd., West Street, Erith, Kent.

HI-K CERAMICON. No. 693,949, Class 9. Ceramic electrical condensers.—Erie Resistor, Ltd., 2, Carlisle Road, The Hyde, Hendon, London, N.W.9.

A.S.E.E. Annual Dinner

THE annual dinner and reunion of the Association of Supervising Electrical Engineers will be held at the Connaught Rooms, London on 13th April. The president of the Association, Mr. T. G. N. Haldane, will take the chair.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.

Atherstone.—26th February. R.D.C. Street lighting equipment. (See 9th February issue.)

Australia.—BRISBANE.—20th April. City Council. 7,500 kVA transformers. (C.R.E. (I.B.) 52351/51. Ten/2115.)*

7th March. State Electricity Commission. Switchboard panels. (C.R.E. (I.B.) 51683/51. Ten/2103.)*

5th April. City Electric Light Co., Brisbane. Supply, delivery and maintenance of one 7,000 kVA, 3-phase, 33/5.2 kV indoor type transformer. (C.R.E. (I.B.) 51608/51. Ten/2101.)*

Bournemouth.—9th March. Corporation. Dismantling and removal of existing lifts and supply and installation of electric passenger lifts at the Town Hall. (See 9th February issue.)

Brighouse.—10th March. Borough Council. Street lighting standards, lanterns and fittings, Bradford-Huddersfield road. (See this issue.)

Cheadle & Gatley.—28th February. U.D.C. Street lighting equipment for the year ending 31st March, 1952. (See this issue.)

Dagenham.—24th February. Town Council. Street lighting conversion. (See 9th February issue.)

Huddersfield.—28th February. Town Council. Lamps and cables for one year. Borough surveyor, High Street Buildings.

Keighley.—10th March. Corporation. Fluorescent lighting at public abattoir. (See 9th February issue.)

Lincoln.—16th March. County Council. Electrical work at new secondary school, North Hykeham. (See 9th February issue.)

New Zealand.—AUCKLAND.—2nd April. Auckland Electric Power Board. Fifty-five 300 kVA, and eight 450 kVA transformers. (C.R.E. (I.B.) 51965/51. Ten/2087.)* 16th April. Cable. (C.R.E. (I.B.) 51966/51. Ten/2086.)*

Sunderland.—Town Council. Electrical installation in new crematorium at Bishopwearmouth Cemetery. Borough architect, Grange House, Stockton Road, Sunderland.

Tangier.—22nd March. Tangier Zone Water and Electricity Services Administration. Water-cooling plant for Mogoga power station. (C.R.E. (I.B.) 52171/51. Ten/2095.)*

Thailand.—BANGKOK.—15th March. Stores Division, Railways Department. Underground cables for railway signalling. (C.R.E. (I.B.) 52557/51. Ten/2116.)*

Thurrock.—27th February. U.D.C. Refrigerators for council houses. (See 9th February issue.)

Uruguay.—MONTEVIDEO.—10th March. Servicio Official de Difusion Radio Electrica. Radio material, recording equipment, measuring instruments, generating sets, transformers, telephones, etc. (C.R.E. (I.B.) 52226/51. Ten/2141.)*

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1 (Victoria 9040).

ORDERS PLACED

Dudley.—Corporation. Recommended. Lamp columns and lanterns for the Birmingham-Wolverhampton trunk road (£3,349).—Revo Electric Co., Ltd.

Eastbourne.—Corporation. Re-wiring and carrying out of electrical work in the eastern half of the Town Hall (£1,328).—South Eastern Electricity Board.

Ennerdale (Cumberland).—R.D.C. Supply and erection of street lighting equipment at Smithfield, Egremont and Cragg Road, Cleator Moor.—G.E.C.

Glasgow.—Corporation Transport Committee. Recommended. Replacing with a 50 c/s alternator the 25 c/s alternator of the existing 10 MW turbo-alternator at the Pinkston power station (£31,500).—Metropolitan-Vickers.

Liverpool.—Corporation Libraries Committee. Recommended. Fluorescent lighting fittings for the Walker Art Gallery (£2,267).—G.E.C. Special lighting fittings for lecture hall at Walker Art Gallery (£180).—Troughton & Young, Ltd.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Bakewell.—Houses (28), Eyam and Hathersage; R. Hayhurst, R.D.C. surveyor.

Beckenham.—Infants' school, Spring Park; H. Pite, architect, 24, Chancery Lane, W.C.2.

Birmingham.—Junior school, Greenholm Road; W. B. & F. T. Archer, Ltd., Rookery Road, Birmingham.

Blaina (Mon).—Out-patients' department and staff quarters for North Monmouthshire Hospital Management Committee; Merton Jones & Son, architects, St. Mary's Chambers, Abergavenny.

Boldon.—Houses (142) with shopping centre, Boldon housing scheme (Section 3); U.D.C. surveyor.

Bolton.—Printing works, Bradford Avenue and Manchester Road; Tillotsons, Ltd., Mealhouse Lane.

Brighton.—Factory, East Moulsecomb; Remploy, Ltd., 25, Buckingham Gate, S.W.1.

Chester-le-Street.—Houses (166); R.D.C. surveyor.

Chesterfield.—Proposed nine-storey extension at technical college; county architect, Derby.

Chorley.—Houses (65), Tootell Street site; borough surveyor, Town Hall.

Clitheroe.—Houses (36), Goosebutts site; Hawthorne Bros., Ltd., Cleveleys, Blackpool.

Croydon.—Factory, New Addington industrial estate; A. B. Mould & Construction Co., Ltd., 92, Whitehorse Road.

Dagenham.—Maisonnettes (40), Heath Park estate; Norman and Dawbarn, 5, Gower Street, W.C.1.

Edinburgh.—Three-storey addition to premises (£40,000); Andersons, Ltd., 33, Montgomery Street.

Edmonton.—Showroom; Century Glass Works, Ltd., Angel Factory estate, Angel Road.

Exeter.—Showrooms and offices; Montague Burton, Ltd., Hudson Road Mills, Leeds, 9.

Finchley.—Flats (69), Nether Street; Robert Sharp, surveyor, 1258, High Road, N.20.

Gateshead.—Additions to carpet factory, Team Valley; Arthur and Kirkup, architects, 13, Swinburne Street, Gateshead.

Glasgow.—Flats for aged people (64), Mansewood and Merrylee Road (£93,120); town clerk, City Chambers.

Golborne.—Factory, Glazbury; Imperial Chemical Industries, Ltd., Ship Canal House, King Street, Manchester.

Heckmondwike.—Houses (156), and eight shops, Dale Lane; clerk to U.D.C., Midland Bank Chambers.

Hove.—Flats (70), St. Helens estate; borough surveyor.

Ilford.—Flats (57), Mossford Green; Tout & Finch, Ltd., builders, 61, Victoria Road, Romford.

Ilkeston.—College of further education (£110,000 for first section); county architect, County Offices, St. Mary's Gate, Derby.

Kidderminster.—Houses (50), Franche estate; borough surveyor.

Leeds.—Houses and flats (278), Belle Isle, Moortown and Seacroft estates; city architect, Priestley House, Quarry Hill.

Liverpool.—X-ray department, Block "H," Newsham Hospital, for Regional Hospital Board; W. Braithwaite & Son, 229, West Derby Road, Liverpool, 6.

London.—WESTMINSTER.—Flats (570), second section of Pimlico estate, for City Council; Powell and Moya, architects, 36, Great Smith Street, S.W.1.

Maidstone.—Houses (136), Shepway estate, borough surveyor.

Middlesbrough.—Primary school, Thorntree estate (£115,000); Leslie & Co., builders, Woodlands Road, Darlington.

Milnrow.—Flats (50), Firgrove, for U.D.C.; J. Gerrard & Sons, Ltd., Swinton, Manchester.

Newcastle-on-Tyne.—Primary schools: Denton Square; C. H. Errington, architect, 46, Grainger Street. Stocksfield Avenue; P. L. Browne, Son and Harding, architects, Pearl Buildings, Northumberland Street. Broadwood Road; city architect, 18, Cloth Market.

North Shields.—Laboratories and offices, Hayhole Lead Works; Associated Lead Manufacturers, Ltd., Crescent House, Newcastle-on-Tyne.

Oldham.—Houses (132), Fitton Hill; Unit Construction Co., Ltd., Knutsford.

Smethwick.—Dwellings (22), Abbey Road and Pargeter Road; Lee Bros, Ltd., 35, Witton Lane, Hill Top, Wednesbury.

Solihull.—Grammar school; U.D.C. surveyor, 90, Station Road, Solihull, near Birmingham.

Southport.—Police station, Segars Lane, Ainsdale; Norman Jones, Sons and Rigby, architects, Lord Street.

Stalybridge.—Houses (122), Stamford Street; Howard and Benson, architects, 88, Mosley Street, Manchester.

Sunderland.—Rebuilding of war damaged furniture factory for P. Bergsman & Co., Atlas Works; F. J. Hepple, Dunn Street, Newcastle-on-Tyne.

Swansea.—R.C. Church, Jersey Road. The name of the architect was incorrectly given in our issue of 2nd February. He is Mr. C. A. Hughes, 51, Walter Street, Swansea.

Towcester.—Houses (86), Blisworth; G. Berridge, R.D.C. surveyor.

Tutbury.—Houses (10), Sudbury Road, Yoxall, for R.D.C.; Carney Bros., Brewery Street, Rugeley.

Wakefield.—Factory premises, Horbury Road: Subaseal, Ltd., 4, Wormald Road, Leeds.

Weymouth.—Conversion of buildings at junction of St. Edmund Street and Maiden Street into offices, etc.; borough surveyor, 6, Pulteney Buildings.

Whitby.—County modern and primary schools; J. Catchpole, county architect, Northallerton.

Whitehaven.—First stage of civic hall scheme (£10,000); borough engineer.

Wolverhampton.—Houses (94), Moreton estate; N. Hyde, 6, Claremont Road, Sedgeley.

Second instalment of Northicote Secondary School; A. M. Griffiths & Son, Ltd., Thomas Street.

Worcestershire.—Primary school, Lickey; Wm. Weaver, Ltd., 22, Birmingham Road, Bromsgrove.